



Aerospace Industry Support Initiative

an initiative of **the dtic**



2022/23

IMPACT REPORT



the dtic

Department:
Trade, Industry and Competition
REPUBLIC OF SOUTH AFRICA



CSIR

Touching lives through innovation

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AISI VISION

To position the South African aerospace-, defence- and marine-related manufacturing industry as a global leader, in niche areas.

AISI MISSION

To enhance the global competitiveness of the South African aerospace, defence and marine manufacturing industry by:

- Developing relevant industry-focused capability and facilitate associated transfer of technology to industry;
- Identifying, developing, supporting and promoting the interests and capabilities of the South African aerospace, defence and marine manufacturing industry;
- Implementing industrial policies in support of government strategic objectives including growth, employment, transformation and equity.

OVERVIEW

The Aerospace Industry Support Initiative (AISI) is an intervention of the Department of Trade, Industry and Competition (**the dtic**). Created by the Advanced Manufacturing Chief Directorate, the AISI is designed to foster industrial development and competitiveness in the local South African aeronautics, defence, space and marine industries.

The initiative takes its strategic direction from government's objectives with emphasis on the industrialisation of technology, industry transformation, and job creation.

In presenting this Impact Report for 2022/23, the AISI management extends its gratitude to **the dtic**, the local aerospace, defence and marine manufacturing industries, the AISI team, and its host organisation, the Council for Scientific and Industrial Research (CSIR).

IMPACT ACHIEVED

During the 2022/23 financial year, the AISI supported 17 projects in the aerospace and defence manufacturing industries, a further 12 projects in the marine manufacturing and associated services sector, as well as 11 sector-wide projects. Each of these projects serves one or multiple product markets.

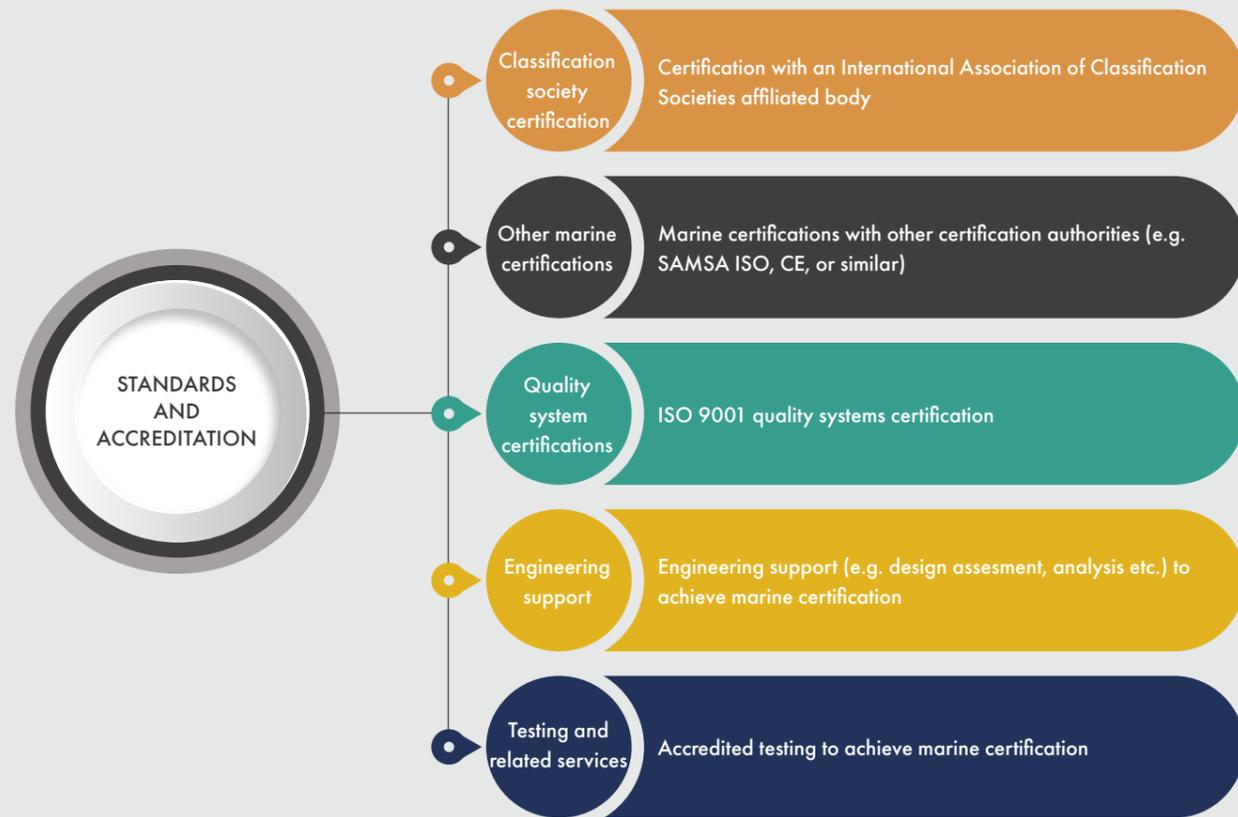
Significant progress was made in 2022/23 with respect to the development of local capabilities, advancement of technology solutions, and exports. The AISI support extended to 52 SMMEs – directly and indirectly, it enabled the creation of 80 new highly skilled jobs and the retention of a further 39 highly skilled jobs.

The AISI aeronautics, space and defence technology support thematic areas for 2022/23 ranged from aerostructures, to space, avionics, and propulsion, as well as surveillance and data manufacturing systems.

The marine manufacturing and repairs supplier development programme promoted the maximisation of local content in manufacturing and supported South African maritime companies to acquire relevant standards and accreditation for integration into local and global supply chains, as well as support for technology enhancement.

This report provides a narrative account of the aerospace, defence, maritime and other sector projects supported by the AISI during the year under review. The content is based on interviews with beneficiaries, and is intended to demonstrate the progress made during the year, increase awareness of South Africa's innovative aerospace, defence and maritime sectors and showcase the impact achieved by the AISI through its various support interventions.





AEROSPACE PRODUCT AND TECHNOLOGY MATRIX



AISI PROGRAMMES

Since 2006, the AISI has enabled **the dtic** to achieve the following sectoral development goals:

- Supplier and small, medium and micro enterprise (SMME) development
- Job creation and retention
- Technology development
- Industrialisation of technology
- Localisation and import substitution
- Exports promotion
- Fostering transformation in the industry with a focus on women and youth empowerment.

These goals are achieved through the implementation of programme-level interventions within specific technology streams and product markets. The AISI utilises relevant tools such as technology roadmapping to facilitate the development of technology strategies for respective AISI beneficiaries.

This enables the AISI to identify specific interventions within its mandate to assist in improving the competitiveness of local industry.

The AISI programmes are designed to assist industry in overcoming challenges, building local capabilities and technological solutions, and enhancing global competitiveness. The five programmes that support the implementation of the AISI mandate are:

TECHNOLOGY-BASED SUPPLIER DEVELOPMENT

The AISI's Technology-Based Supplier Development intervention provides enabling mechanisms to assist industry to improve productivity, implement quality management systems, optimise operations, and enhance integration into global supply chains.

These interventions are implemented with a specific aim of broadening the industrial base by encouraging original equipment manufacturers (OEMs), integrators and sub-systems suppliers to work with SMMEs and lower-tier suppliers in technology programmes.

INDUSTRY DEVELOPMENT AND TECHNOLOGY SUPPORT

This programme focuses on advancing production innovation such as the use of advanced manufacturing and other Fourth Industrial Revolution technologies to build more durable, compact and efficient products. Access to new and existing processes, products and methods is also facilitated to ensure that beneficiaries develop products and services that enable them to exploit multiple market opportunities. Integrators and sub-system suppliers are encouraged to include SMMEs and lower-tier suppliers in their supply chains, to enable the continuous transfer of knowledge, expertise, capabilities and technologies, thereby broadening the industrial base.

SECTOR STRATEGIC SUPPORT INITIATIVES

The AISI implements, oversees and contributes projects of national interest through this programme. This includes the development of the Commercial Aviation Industry Development Strategy, the hosting of the Joint Aerospace Steering Committee and contributing to the development of the Aerospace and Defence Masterplan, both at operational and strategic levels.

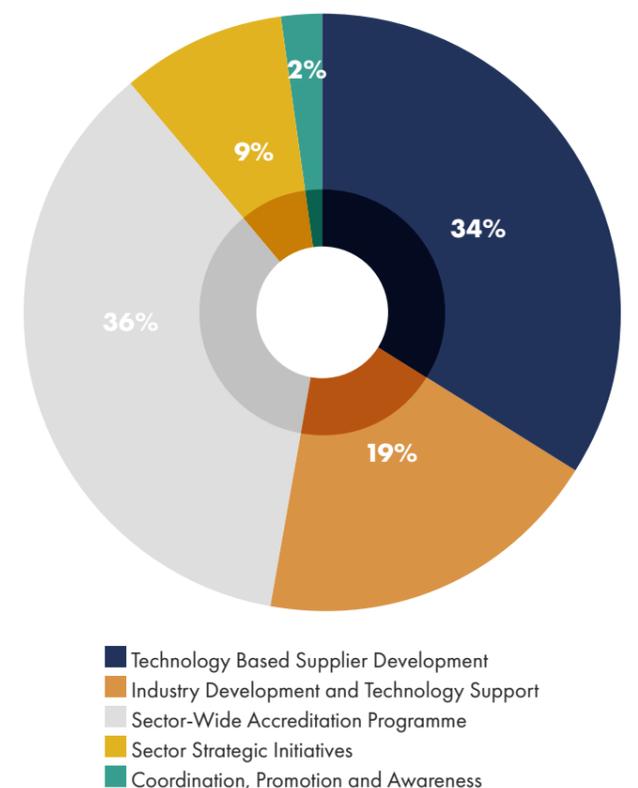
SECTOR-WIDE ACCREDITATION

This programme assists the broader advanced manufacturing industries including marine to enhance their visibility within local and global supply chains and increase their competitiveness.

COORDINATION, PROMOTION AND AWARENESS

The AISI plays a pivotal role in coordinating activities and promoting awareness of the sectors and industries it represents in South Africa. A flagship event is the annual Aeronautical Society of South Africa Conference that brings together local industry players to showcase projects and associated impact achieved during the year.

BUDGET ALLOCATION BY PROGRAMME



AISI IMPACT AND BENEFITS 2022/23 - UPDATE

	Aerospace & Defence	Marine	Sector-Wide Support
 New Technology Development & Advancement	13	3	2
 New Process Development & Advancement	15	15	4
 Highly Skilled New Jobs Created: Total number of jobs created duo to the AISI intervention/support	21	8	10
 Highly Skilled Retained Jobs: Total number of jobs retained to the AISI intervention/support	62	16	2
 Export Capability Achieved: Capability arising from the AISI intervention that initiates export activities or business	7	1	
 Import Substitution Achieved: Capability arising from AISI intervention that initiates localisation	9	2	1
 Number of SMMEs involved in projects (direct & indirect): The number of manufacturing SMMEs which, according to the National Small Business Amendment Act, No. 28 of 2003, have less than: <ul style="list-style-type: none"> 200 full-time employees; R51 million annual turnover, and R19 million total gross asset value (fixed property excluded) that are either directly or indirectly working on the execution of the project 	39	9	4
 Industry-focused skills development (internal and external): Total number of personnel or students trained as a result of the AISI intervention/support in the benefiting company or companies that are working with the benefiting company	39	18	6
 Standards & Accreditation Support	5	8	6
 Facilitate access to national infrastructure (number of academic institutions & science councils involved)	11	6	6

PROGRAMME 1: TECHNOLOGY-BASED SUPPLIER DEVELOPMENT

The technology-based supplier development programme is the main programme through which the AISI supports the aeronautics, defence and space industries in South Africa. Its enabling mechanisms are crafted to assist industry to improve competitiveness, productivity and quality management systems.

Through this assistance, industry optimises its operations and procedures, ensuring that the South African aerospace industry is easily integrated into global supply chains. The strategic focus remains on SMMEs with the objective of industry transformation, and the broadening of the economic base participating in the industry.

Economic benefits derived through supplier development projects include enhanced competitiveness, increased productivity, integration into supply chains, improved lead times and quality, cost

savings, compliance with environmental standards, better delivery performance, greater customer satisfaction, as well as job creation and retention.

During the year under review, the programme has remained a crucial partner to South Africa's aeronautics, defence and space industries. An ongoing challenge that has affected a number of the beneficiaries is the delay in securing critical parts, components and raw materials where required.

The AISI continues to play an important role in providing finances and networks to help these companies manage the often challenging project transition from mid technology development through to commercialisation.

TECHNOLOGY ENHANCEMENT

Table 1: Technology enhancement beneficiaries during 2022/23

Beneficiary Name	Project Title
Shrike Marine	Vehicle Power Management System Demo Set
Jonker Sailplanes	R24m Wingspan Open Class JS: Phase 2
LambdaG	3-D Printed Microwave Sub-Assemblies
Lambda G	Global Navigation Satellite System Antenna Development
Micromax	Beretta Frame Industrialisation
Paramount Aerospace Industries/CSIR	Application of additive manufacturing for the manufacture of critical aircraft parts
Cape Aerospace Technologies	400N gas turbine industrialisation: phase 3

STANDARD AND ACCREDITATIONS

Table 2: AISI standards and accreditations beneficiaries during 2022/23

Beneficiary Name	Project Title
Luvhone Engineering	ISO 9001 and ISO 14001 development, implementation and certification
West Engineering	AS/EN 9100 Surveillance Audit
Compumach	AS/EN 9100 Surveillance Audit
JJ Harnessing	ISO 9001 and ISO 14001 development and implementation
Shrike Marine	ISO 9001 certification

VEHICLE ELECTRICAL POWER MANAGEMENT SYSTEM DESIGNED TO ADDRESS SPECIFIC NEEDS OF MODERN MILITARY VEHICLES



PRODUCT MARKETS:

Marine, aviation, defence, UAV, vehicle systems



TECHNOLOGY STREAMS:

Engineering, ICT Services

► BENEFICIARY:

Shrike Marine

► PROJECT TITLE:

Vehicle power management system demo system

Shrike Marine was founded in South Africa to provide specialised electronic hardware solutions with a focus on high frequency, power supply and power distribution systems primarily for military use. They manufacture internal and external cable harnessing assemblies to military specifications for use in marine, aviation, defence, UAV, and vehicle systems.

The company works to deliver internationally competitive and high-quality products to an array of local and international customers. Their solutions include design, development and manufacture of products and systems, equipment, component procurement, integration, and testing of sub-systems as well as training, maintenance and support. Shrike Marine serves the local South African market, the UAE, Saudi Arabia and Malaysia, among others.

The funding provided by the AISI to Shrike Marine was for the development and test of a vehicle power management system demo set.

“Modern military vehicle functions are becoming ever more complex and power-hungry, and legacy systems with conventional circuit breakers and bulky wiring are ineffective in addressing the new demands,” comments Rhi Guthrie, Business Development Director for Shrike Marine. “Effective power management to support mission-critical command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) domains, as well as, sophisticated mechanical subsystems require platform-specific electrical systems architecture.”

Shrike Marine’s vehicle electrical power management system (VEPMS) is designed to address the specific needs of modern military vehicles. The system is modular, fully scalable, highly cost effective, as well as space and weight efficient. It allows fingertip control over all vehicle and fighting platform/ancillary functions and mechanical push buttons are completely configurable to satisfy vehicle crew requirements. Information and data can be formatted and displayed as needed anywhere in the vehicle, or transmitted back to command headquarters.

User-defined states or modes of operation are fully customisable and can be triggered automatically or manually operated. Available outputs ensure upgradability and permit a single vehicle to be configured for multiple roles in one interactive, seamless system.

“We sought AISI funding to boost growth and production output,” adds Guthrie “and our advanced manufacturing processes would also result in a highly technical and specialised workforce that could positively contribute to a technically skilled workforce in South Africa.”

“With increased productivity and improved quality systems, the products designed by Shrike Marine would open business both locally and internationally. In achieving this, this project would effectively meet two key pillars in South Africa’s Aerospace and Defence Masterplan,” concludes Guthrie.



NEW TECHNOLOGY DEVELOPMENT



EXPORT CAPABILITY ACHIEVED

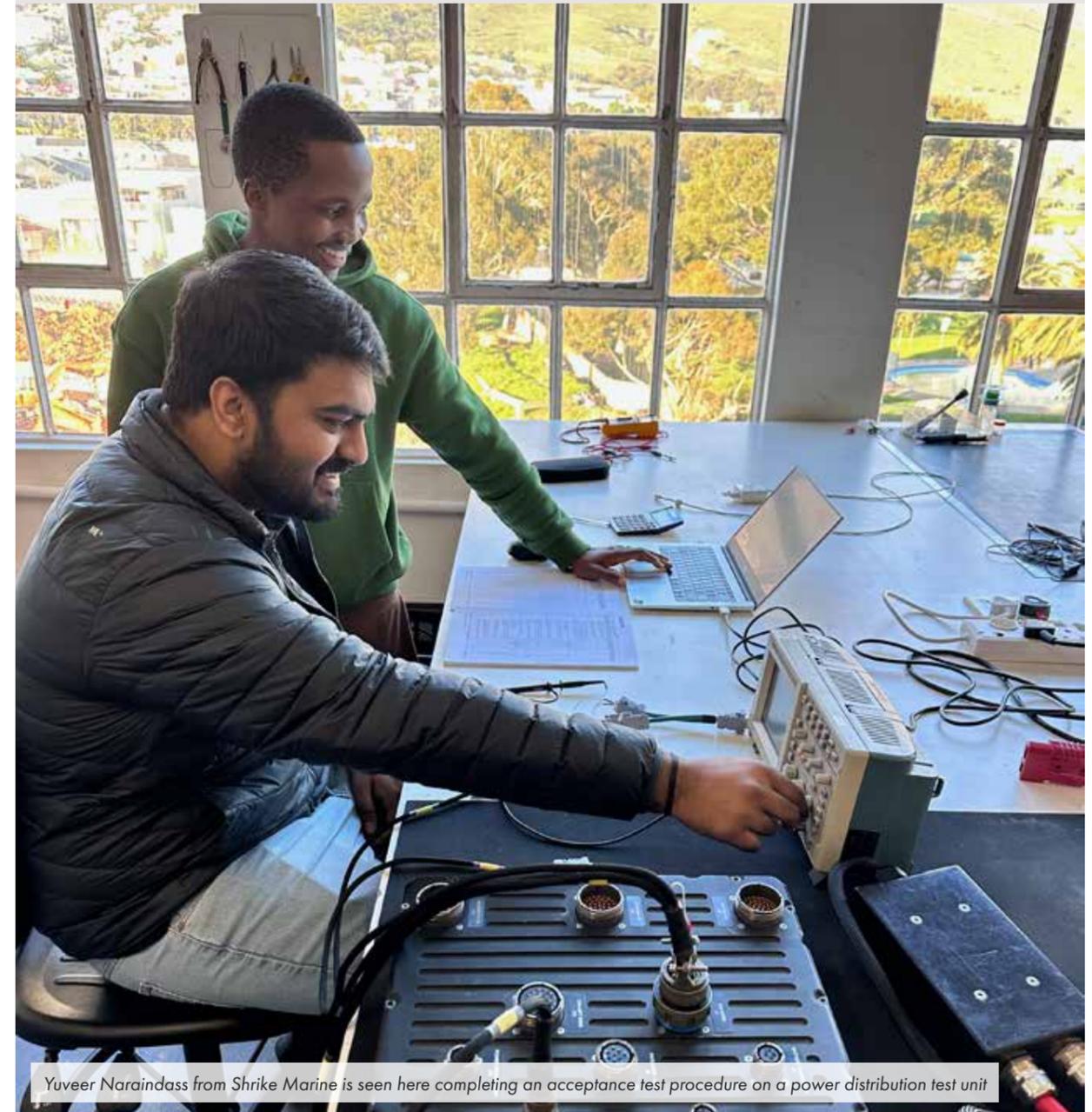


2 SKILLED JOBS RETAINED

SHRIKE MARINE’S RESPONSE TO TWO KEY PILLARS IN SOUTH AFRICA’S AEROSPACE AND DEFENCE MASTERPLAN

The Aerospace and Defence Masterplan adopted in October 2020 outlines several clear goals and plans for the stabilisation

and development of the sector. The first pillar of the Masterplan is increasing market access, and this includes doubling South African defence exports by the end of 2025. The second pillar aims to further government to government marketing and help increase export earnings and position South Africa as the regional centre of excellence for maintenance, repair and overhaul and the supplier of choice for commercial unmanned aerial vehicle manufacturing and operations, and armoured vehicles.



Yuveer Naraindass from Shrike Marine is seen here completing an acceptance test procedure on a power distribution test unit

DEVELOPMENT OF 24M OPEN CLASS SAILPLANE TO FIRMLY CEMENT SOUTH AFRICA'S EXPERTISE INTERNATIONALLY



PRODUCT MARKETS:
Sailplane enthusiasts



TECHNOLOGY STREAMS:
Composite manufacturing

► **BENEFICIARY:**
Jonker Sailplanes

► **PROJECT TITLE:**
24m Wingspan Open Class JS: Phase 2

Since its establishment in 2001, Jonker Sailplanes has worked steadily to make its mark on the international gliding industry through the design, development and production of quality sailplanes. Having successfully developed a sailplane with a 21 m wingspan that took to the skies in 2021, the team at Jonker Sailplanes set their sights on developing a larger model.

The design and development of the open class JS with a 24m wingspan started in 2018 and the design was completed in the beginning of 2022. During the 2022/23 financial period AISI funding supported the tooling process in preparation for the manufacture of the first prototype.

"Once the new model with the 24m wingspan is developed and ready for production, it will not be the only one in its class internationally, but it will be the only one of its size destined for mass production," says AP Kotze from Jonker Sailplanes. "It will however be the only one in its class in South Africa."

It is important to qualify the concept of mass production. Whereas international manufacturers of sailplanes in this class will produce less than ten units on an annual basis, Jonker Sailplanes intends producing 60 units on an annual basis that will position Jonker Sailplanes as a leading international supplier of quality open class sailplanes.

In addition to flying the South African flag high for technological development, Jonker Sailplanes employs 80 production workers and is therefore an important contributor to socioeconomic development in its immediate community and the country.

Skills development is a key priority at Jonker Sailplanes and the company is an active participant in FNB's 1st job initiative. Young people with a technical aptitude participate in a year long learnership that involves on-the-job training. Four of the young people who have been provided an opportunity to participate in this FNB-funded initiative have gone on to become permanently employed by Jonker Sailplanes.



Jonker Sailplanes operates from a factory situated in Potchefstroom, North West.



TECHNOLOGY DEVELOPMENT AND ENHANCEMENT



EXPORT CAPABILITY POTENTIAL



13 SKILLED JOBS RETAINED

Composite manufacturing is used extensively in the production of sailplanes, yet there is no official training centre for composite workers in South Africa. This is a skill that Jonker Sailplanes has taught extensively on site, in so doing capacitating young people with a scarce skill.

THE ROLE OF THE CSIR IN JONKER SAILPLANES' SUCCESS

In recent years, Jonker Sailplanes has worked closely with the CSIR conducting ground vibration and flutter testing on previously developed models. This relationship resulted in the successful launch of the open class sailplane with a 21 metre wingspan. The funding provided by AISI and access to the technical expertise of the CSIR has made a substantial contribution to the success of Jonker Sailplanes, that in turn ensures the company can continue to make a contribution to technological advancements, job creation and skills development.

Once development of the 24 metre open class sailplane is completed, the project will make a major contribution to South Africa's export objectives and will allow sales into the open class, particularly in the European and Australian markets. In addition, Jonker Sailplanes' global position as a manufacturer and exporter of advanced, competitive and highly sought-after sailplanes will be cemented, as there are no other manufacturers currently taking on the daunting task of the design and development of a new glider in this unlimited performance class.



Composite manufacturing refers to using fibre reinforcement with a resin matrix to create products that are both light and strong. As well as these impressive physical properties, composites also offer economic benefits of lower weight and reduced fabrication costs.



Jonker Sailplanes' JS2 Revenant with a 21m wingspan first took the skies in March 2021.

'NEW SPACE' REQUIRES INNOVATIVE LIGHTWEIGHT ANTENNAS



PRODUCT MARKETS:
Space industry



TECHNOLOGY STREAMS:
Additive manufacturing

► **BENEFICIARY:**
LambdaG

► **PROJECT TITLE:**
3-D Printed Microwave Sub-Assemblies

South Africa has a long history in the space industry, both through government and private companies, as a contributor in terms of space engineering and / or mission support. 'New Space' activities or missions, using smaller satellites as opposed to larger traditional spacecraft, are growing exponentially both globally and on the continent and requires space components with low mass, power, and cost.

Traditional waveguide antennas are made in the UK, Europe and US and waveguide antennas and components made using additive manufacturing (AM) complement the requirements of modern small satellites. LambdaG seeks to be a global exporter/supplier of innovative lightweight antenna systems for spacecraft and defence applications. Furthermore, the space sector is vibrantly growing and LambdaG is actively participating with the provision of novel solutions through advanced manufacturing of traditional waveguide antenna assemblies and mounting hardware.

"The project was rolled out over three years," comments Dr Vernon Davids, co-founder and CEO of LambdaG, "and the AISI provided funding support for the entire project."

During phase one in 2019, existing Additive Manufacturing (AM) methods and post-processes were characterised up to Ka-band (40 GHz) frequencies. A final sub-assembly was identified as a Ka-band dual-polarised antenna for data downlink or telemetry. Individual passive waveguide Radio Frequency (RF) components that constitute the sub-assembly were designed and manufactured.

Phase two in 2020 saw the finalisation of individual waveguide components, as well as the combining of two or more individual components to print a monolithic waveguide sub-assembly. During this year, Lambda G also identified the qualification and verification process for producing spaceflight hardware. In addition, The Ka-band TT&C/Payload antenna with mounting hardware was developed and tested to qualification levels.

In 2021, the final phase of the programme, the team at LambdaG developed complimentary hardware (coaxial-to-waveguide

3D printing or additive manufacturing is the construction of a three-dimensional object from a CAD model or a digital 3D model. It can be done in a variety of processes in which material is deposited, joined, or solidified under computer control, with material being added together, typically layer by layer.



COLLABORATION WITH UNIVERSITY OF PRETORIA



NEW TECHNOLOGY DEVELOPMENT/ ENHANCEMENT



3 SMMEs INVOLVED

adapters) and supplier development also took place for an additional metal 3D-printing supplier.

During the third year of the project, LambdaG negotiated a technology demonstration flight opportunity on a micro-satellite to gain flight heritage and further marketing has taken place at local and global conferences and expos, as well as in suitable magazines and publications.

"In space, a lot of focus is placed on the 'qualification' of parts having space heritage before being accepted to fly on space missions," emphasises Davids. "Apart from several requirement-driven discussions with international companies, we have secured a letter of intent from a US-based satellite integrator for a flight opportunity to fly a 3D-printed Horn Antenna Assembly. We are also in discussions locally to use the same technology for a radar application also for space."

LambdaG is the only SMME in South Africa commercially pursuing the development of RF/microwave components and sub-assemblies using additive manufacturing. Intellectual property has been developed through the maturation and qualification of the additive manufacturing processes undertaken. The intellectual property involves a post-process method and requires further funding and testing to qualify this manufacturing method for space usage. At this stage the capability/technology has a TRL of 7 and the cost of securing flight heritage will be shared between a potential client and LambdaG.

The project deliverables have been met through the development of local suppliers and collaborators. One permanent skilled job was created and retained with a requirement to further employ an RF engineer.

"This project aligns well with the goals of the AISI by increasing the contribution of small enterprises to the economy, improving local industry competitiveness, and enabling new suppliers to enter the supply chain, as well as to develop new technologies for the global aerospace and defence markets. Furthermore, this project increases South Africa's advanced manufacturing capabilities and global competitiveness to manufacture high-value, high performance communication components for the local and international space market," concludes Davids.

Skills and Human Capital Development

- A male South African of coloured ethnicity with a PhD in engineering
- A male Indian (aeronautical engineer) contracted as a project manager
- All bookkeeping and logistics were assigned to a female of coloured ethnicity with a PhD
- The contracted services of a mechanical engineer (white male) were used
- A PhD student from the University of Stellenbosch



Dr Vernon Davids is a co-founder and the CEO of LambdaG. He is passionate about life and all things science.





NEW TECHNOLOGY DEVELOPMENT/ ENHANCEMENT



COLLABORATION WITH UNIVERSITY OF PRETORIA AND STELLENBOSCH UNIVERSITY



IMPORT SUBSTITUTION OPPORTUNITY

GNSS ANTENNA DEVELOPMENT TO OFFER COMMERCIALISATION AND BUSINESS OPPORTUNITIES



PRODUCT MARKETS:
Space industry



TECHNOLOGY STREAMS:
Antenna development

▶ **BENEFICIARY:**
LambdaG

▶ **PROJECT TITLE:**
Global Navigation Satellite System Antenna Development

The second project for which LambdaG has received funding from the AISI is a one-year project that seeks to develop a Global Navigation Satellite System (GNSS) antenna. By the end of the financial period being reviewed, LambdaG had primarily focused on project planning, requirement specification development and the design of the radiating element. In addition, a preliminary bill of materials had been identified.

The project experienced a four-month delay, but is on track for completion in December 2023. Once successfully completed, this project will offer several commercialisation/business opportunities for LambdaG. A client of the company will pair the GNSS antenna with their space-based GNSS receiver.



The Beretta 9mm steel gun frame being produced in South Africa



TECHNOLOGY DEVELOPMENT AND ENHANCEMENT



EXPORT CAPABILITY ACHIEVED



6 PEOPLE TRAINED

PRECISION COMPONENT MANUFACTURING ABILITY BOOSTS EXPORT MARKET



PRODUCT MARKETS:
Aviation military and mining



TECHNOLOGY STREAMS:
Milling and turning of precision mechanical components

▶ **BENEFICIARY:**
Micromax

▶ **PROJECT TITLE:**
Beretta Frame Industrialisation



Micromax specialises in precision machining of mechanical components

Micromax is a South African based manufacturing company that specialises in the milling and turning of precision mechanical components catering for the local as well as international aviation, military, mining and other specialised markets. It specialises in industries where extreme attention is required to exact detail. Tight tolerances and machining complexity place high demands on technological requirements and the machining processes to be used.

After being approached by Beretta (Italy) to manufacture a Beretta 9mm steel gun frame locally and Micromax was approved by Beretta as their sole supplier for this product range due to the company's history of supplying international clients with high-quality products. The main objective of the project is to create a local manufacturing process, that uses in-house technology, purchasable technology, as well as selected sub-contractors to work together and develop the value chain that could deliver on their requirements. The main goal of the project was to industrialise and optimise the process and to manufacture 200 frames per month. The monthly production requirement has now been fully achieved.

AISI funding supplied has enabled Micromax to achieve numerous milestones in the manufacturing process, from the initial prototype phase to the delivery of the first 100 frames. To date, Micromax has delivered 500 frames and is fully set up to deliver of 200 frames per month, which was the main goal of the industrialisation process.

The project funding provided by AISI directly supports several AISI goals. These include, development of South African production sector, local supplier development, the export of manufactured components, development of advanced manufacturing techniques in South Africa, as well as the development of trade skills in the country.

Manufacturing and the refinement of the manufacturing process is continuing and will be an ongoing process. When the project started, the run time per frame was 7.38 hours, but this has been reduced to 6.45 hours per frame. Micromax has set a long-term goal of manufacturing a frame in 6 hours. Efficiency gains are expected as more optimisation of processes is carried out and some of the outsourced processes are brought inhouse.

As a result of the support from AISI, Micromax was able to use a consultant to provide guidance on in-process improvements focusing on the appropriate tooling that should be used for each operation. Whilst tooling changes are deemed minor changes, they can drastically reduce the final machining time per frame. Moreover, Micromax was able to employ the services of experts in this field to guide all involved with the complex machining process and to train all local staff on the flow of the new process.

By assisting Micromax, AISI capacitated the company to expand its capabilities without the constraints of not gaining any income from this considerable expense.

LOCAL DEVELOPMENT OF ADDITIVE MANUFACTURING TO BOOST SOUTH AFRICAN AEROSPACE INDUSTRY



PRODUCT MARKETS:
Aerospace



TECHNOLOGY STREAMS:
Additive manufacturing

BENEFICIARY:
Paramount Aerospace Industries/CSIR

PROJECT TITLE:
Application of additive manufacturing for the manufacture of critical aircraft parts

Additive Manufacturing (AM) has broadly been used internationally in the Aerospace industry and leading companies such as Boeing, Airbus, GE and SAFRAN have invested vast amounts in this technology. Given the numerous benefits, AM parts are currently used widely in aeroplanes, from structural to engine parts. However, not a lot of AM is used in the South African aerospace industry, with most of the parts that are flying, being polymer parts.

This project commenced during the 2021/22 period and is a collaboration between the CSIR and Paramount Aerospace Industries (PAI). The main aim of this project having been the use of Design for Additive Manufacturing (DfAM) to develop metal parts according to the specific standards accepted in the Aerospace industry. DfAM is a vital aspect of AM and when properly applied, can reduce the cost to manufacture a part, increase the efficiency of the aircraft by optimising weight or by consolidating multiple parts into one, reduce assembly time.

The CSIR Photonics Centre brought to the table its expertise in metal additive manufacturing (MAM) and mechanical testing. The centre has the capability and capacity to produce large, high quality printed parts in multiple materials and at high speeds.

“The first step undertaken in the previous period was the review and identification of five qualifying parts used in PAI’s Advanced High Performance Reconnaissance Light Aircraft (AHLAC),” explains the CSIR’s Duwan Bester. “We analysed 14 parts in total, reviewing the computer aided design models to see how suitable they are for AM. The review process considered the complexity of the designs and whether the design can be modified to better suit the AM process and potential reduction in manufacturing cost.”

Five parts were identified and shortlisted for the project with each one having been selected on the basis that it addresses at least one of the benefits of AM. The five parts targeted and agreed upon for AM development and qualification were the upper hinge rudder bracket; the fuel strainers; canopy guide; forward cockpit control cable mount and the engine oil drainage bracket.

Once production and testing of the five identified parts had been concluded, the results successfully showed that there are clear benefits to using MAM in the local Aerospace industry, not just from a weight saving perspective, but also from a cost perspective.

All the parts that were focused on in this project (except for part 1, which was used to show the qualification path of a critical part) and taken through the DfAM process resulted in a significant reduction in cost and in three of the four parts, a saving in weight as well.

The cost saving will help improve the overall cost of the aircraft and make it more competitive, whereas the weight saving will increase its in-flight efficiency. Another benefit that should be mentioned is the lead time on these parts, which is between one and two weeks, including heat treatment and post-processing. A further reduction in cost can be achieved by doing batches of parts to utilise as much of a machine’s build envelop as possible. Heat treatment cost will also be more economical by doing a batch build.

The project proved that there is a significant cost and weight saving that can be achieved by using AM and that the manufactured parts can be qualified using industry accepted standards. The impact of the project is that more DfAM skills in the local Aerospace were developed and that these skills can help PAI become more competitive internationally.

All the objectives of the project were successfully achieved, except for implementation. The printed parts were given to PAI for fitting on the AHLAC and feedback is being awaited.

Commenting on the role of AISI in this project, Andries Uys, PAI’s Chief Technical Officer says: “The AISI is a great vehicle for small projects and if I look at where we are today especially in aerospace, the decline of the big parastatals has allowed us to re-establish some capability and focus on a new generation of young engineers capable in different technologies. I believe if the AISI can give them that exposure and opportunity to use world-class tools and obtain results, it becomes a great enabler and skills multiplier to retain the bright minds in South Africa.”



TECHNOLOGY DEVELOPMENT AND ENHANCEMENT



6 PEOPLE TRAINED



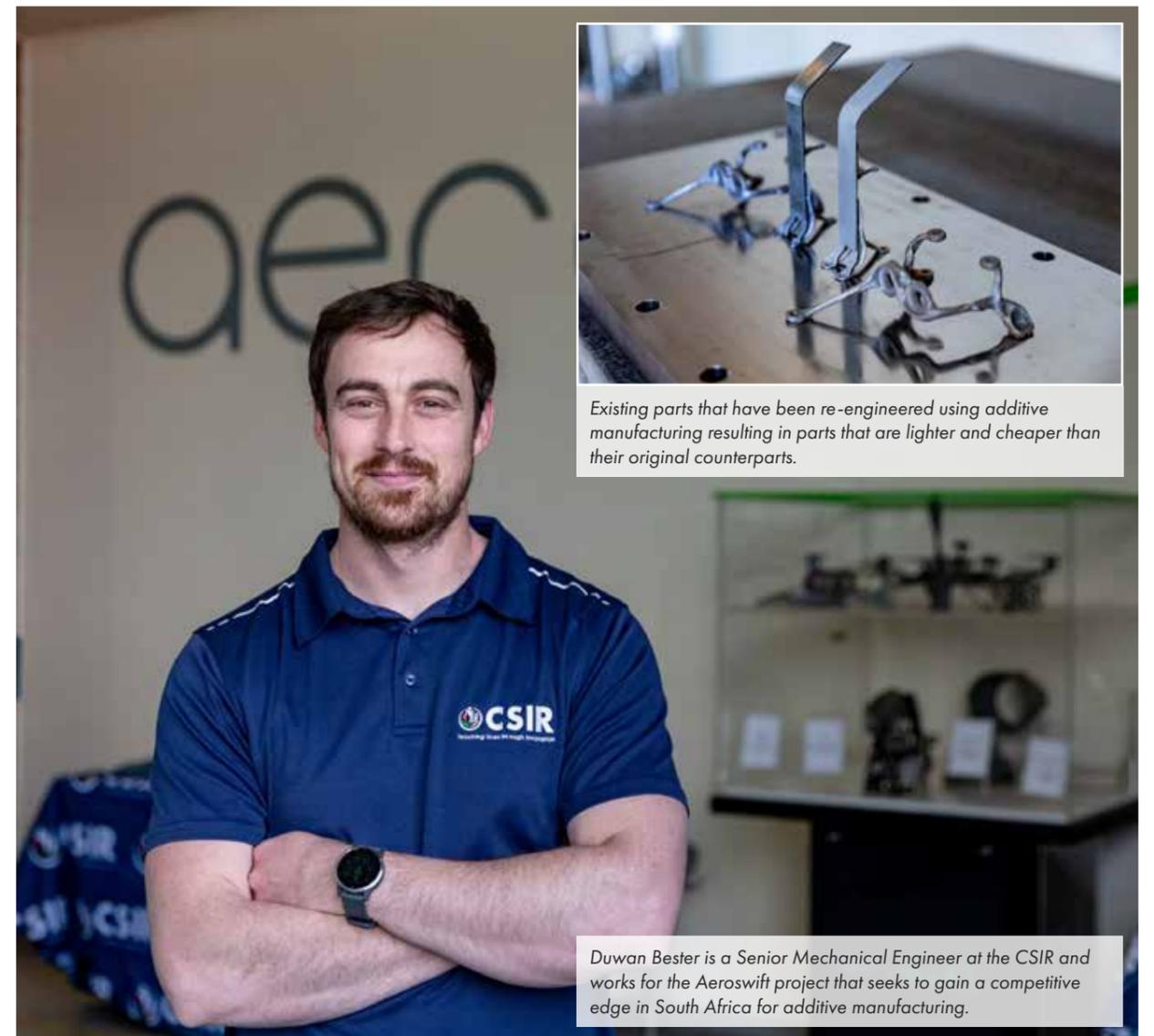
4 SMMEs INVOLVED

ADDITIVE MANUFACTURING (AM)

AM is defined as a process of joining materials to make objects from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing methodologies. Many different material types are used in AM, like metals, polymers, ceramics, composites, and even biological systems. The process provides many benefits, such as rapid prototyping, where the time between concept and the final design is greatly reduced by the ability to quickly test design iterations, make improvements to the design, and then end up with a final product.

DESIGN FOR ADDITIVE MANUFACTURING (DFAM)

DfAM is the skill that is used to design a part for better manufacturability using AM and the thought process behind DfAM is much different than that of traditional manufacturing in that the process empowers engineers to create more intricate shapes and production parts while reducing weight and material consumption. There are also many different tools that a designer can use that streamlines the process and help with producing a final part in a shorter period.



Existing parts that have been re-engineered using additive manufacturing resulting in parts that are lighter and cheaper than their original counterparts.

Duwan Bester is a Senior Mechanical Engineer at the CSIR and works for the Aeroswift project that seeks to gain a competitive edge in South Africa for additive manufacturing.

SUB 400 INDIGENOUS PROPULSION SYSTEM TO MEET LOCAL AND INTERNATIONAL MARKET NEEDS



PRODUCT MARKETS:
Military and civilian aviation



TECHNOLOGY STREAMS:
Gas turbine propulsion system

► **BENEFICIARY:**
Cape Aerospace Technologies

► **PROJECT TITLE:**
400N gas turbine industrialisation: phase 3

Propulsion is a key component of any aerospace industry and identified as a missing element in the overall South African system. The objective behind this project was an indigenous propulsion system, that falls outside MTCR (Missile Technology Control Regime) requirements, required by both the military and civilian markets in South Africa. A sub 400 N product in the local and lucrative export market would boost South Africa's aerospace industry's capability and create an international market presence.



Increased demand for this product by players such as Denel Dynamics, ARMSCOR and Jonker Sailplanes, and following the successful delivery of CAT 250 turbines by Cape Aerospace Technologies (CAT), that caught the attention of various international clients, prompted CAT to embark on the ambitious 36-month project to design, manufacture and industrialise a 400 N gas turbine.

Knowledge gained by CAT on the previously developed 250N gas turbine, combined with support from the AISI facilitated the launch of the project.

"A sub 400 N micro gas turbine was considered uncontrolled by International Traffic in Arms Regulations standards and presented us with an opportunity to develop a niche sector through support for a single product with potential to expand into a multitude of markets," explains CAT Managing Director David Krige, who also heads up the propulsion systems unit.

All gas turbine related components, including ancillaries, were designed in phase one and then manufactured and tested in phase two. Phase three, carried out during the review period, involved the industrialisation of the final prototype engine, including all turbine ancillaries.

Project highlights include the promotion of component and product localisation, the CAT 400 prototype produced 460N thrust at standard temperature and pressure (STP) and performed well when tested at 14 000ft altitude that drew praise from Jonker Sailplanes. CAT received a lot of interest for the CAT400 engine from international clients, some clients requested engines on preorder. The first batch of CAT400 engines were delivered to Turkey with larger orders expected in 2023.

Jonker Sailplanes is a leading exporter of sailplanes to the global gliding community. Uys Jonker, CEO of Jonker Sailplanes, indicated they wish to make use of a local propulsion system for their range extenders on the JS3 sailplanes. They currently make use of a German-Engineered MGT rated at 400 N thrust.

Commenting on the support from AISI, Krige says: "The engineers at CAT are ever determined to lead the way in the development of superior products that respond to industry demands and the AISI has assisted tremendously in making this happen. Their support has allowed CAT to make a name for itself in the micro gas turbine, military and civilian industries."

CAT FOCUS ON SKILLS AND RESEARCH DEVELOPMENT

Skills and research development are important to CAT and since 2009, several students have started doing research on micro gas turbines at the Stellenbosch University (SU), gaining knowledge and insight into turbomachinery. The micro gas turbines and turbine related equipment used by the students are supplied by CAT. The interest in micro gas turbines has grown considerably at the SU due to the exposure given



TECHNOLOGY DEVELOPMENT AND ENHANCEMENT



EXPORT CAPABILITY ACHIEVED



SUPPORT FOR STUDENTS AT STELLENBOSCH UNIVERSITY

to the students and to date over 20 students have benefitted from the relationship between SU and CAT.

CAT continues to assist undergraduate and postgraduate students at SU and boasts several achievements over the span of its and its members' existence since 2000. Below are a few achievements to demonstrate the company's technical capabilities:

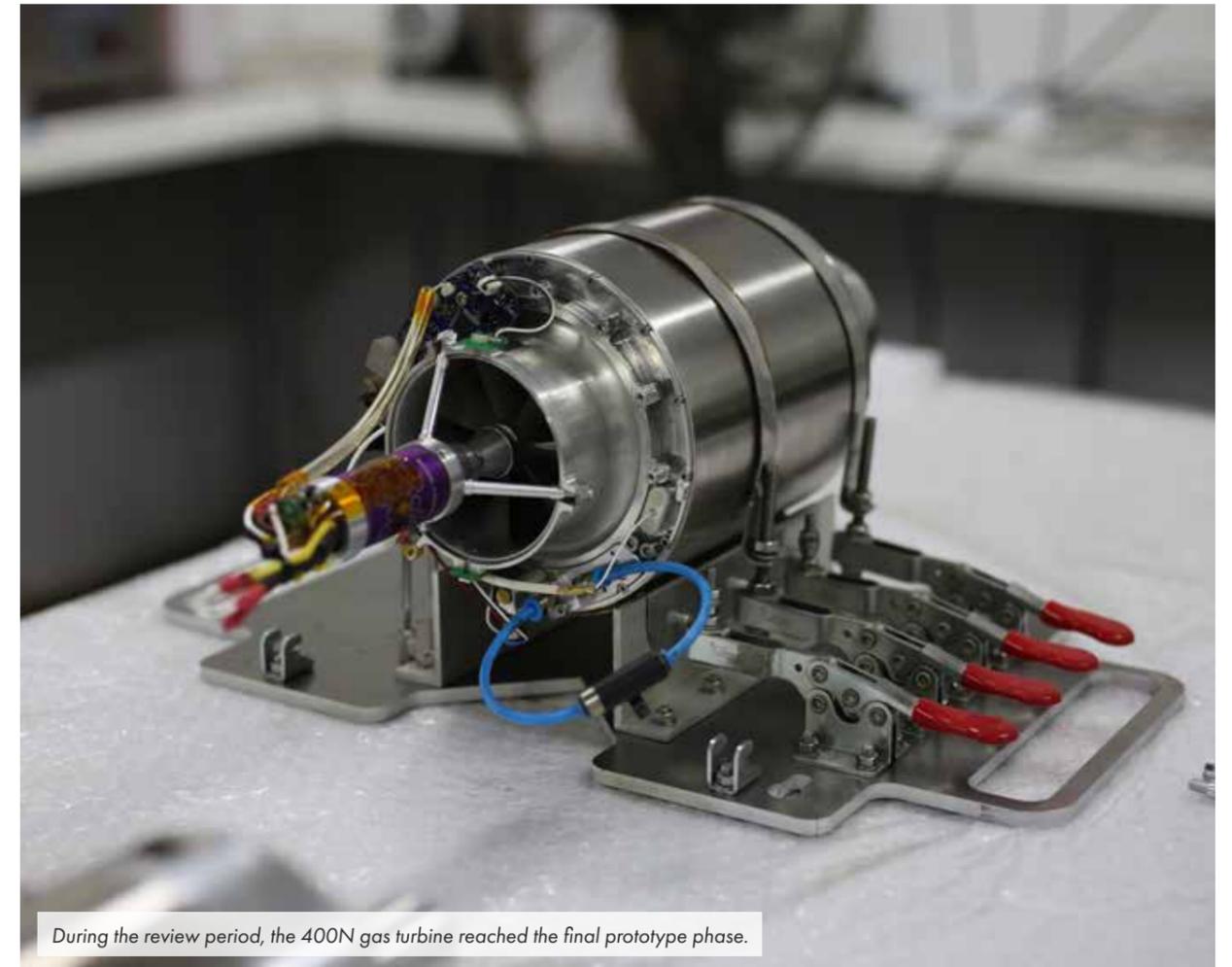
- Designed and built the first pulse jet in RSA in 1980's
- Developed the first single fuel electric start system in the world in 1999 ahead of its competitors
- First company to receive certification to sell Kero-start turbines in the USA in 2003 that resulted in a favourable review in the international RC magazine
- World's first plasma ignition system for micro gas turbines that allows for fast and reliable high altitude starts and the system outperforms the life of glowplugs
- Designed and built a target drone that included all telemetry, comms, turbines and composite airframe

- In June 2019 developed the first fully web enabled gas turbine user interface, data logging and remote "Over the Air" software update capability.

ABOUT CAPE AEROSPACE TECHNOLOGIES

CAT is currently the only turbine manufacturer in Africa and provides the micro- and small gas turbine industries with various propulsion system solutions. The company designs, manufactures, and tests high performance gas turbines for use in model aircraft, high speed target drones, missiles, UAVs, experimental aircraft, and full-size gliders.

Over its existence, CAT has built and created a broad network of contacts and global bodies interested in its products. The military department of Rolls Royce in the United Kingdom made contact to make use of CAT's services and expertise on MGT's, including clients from the UK and Middle East. CAT has successfully displayed a range of its turbines at various military, defence and security trade shows.



During the review period, the 400N gas turbine reached the final prototype phase.



STANDARDS AND ACCREDITATION SUPPORT



7 PEOPLE TRAINED



2 SMMEs INVOLVED



STANDARDS AND ACCREDITATION SUPPORT



2 SKILLED JOBS RETAINED



6 SMMEs INVOLVED

WOMAN OWNED ENGINEERING SERVICES SMME SETS ITS SIGHTS ON NEW SPACE OPPORTUNITIES

PRODUCT MARKETS:
Aerospace, broadcast and ICT

TECHNOLOGY STREAMS:
Engineering, ICT Services

► **BENEFICIARY:**
Luvhone Engineering

► **PROJECT TITLE:**
ISO 9001 and ISO 14001 development, implementation and certification

Armed with an M. Sc. Degree in Technology Management and the sheer will to succeed, in 2015 Leago Takalani started Luvhone Engineering. Her mission was to create an advanced technology engineering organisation with global presence, while developing products for both domestic and international markets. Equally important, she wanted to create an environment that enabled young people to realise their dreams in the engineering field.



A key success factor would be ISO 9001, ISO 14001 and Deutsche Akkreditierungstelle (DAKks) certification and it is here that AISI funding played an important role during the 2022/23 financial period. The funding provided by AISI facilitated the successful achievement of all the requirements for these certifications that has enabled Luvhone Engineering to pursue both local and international business opportunities where ISO and/or DAKks certification are a prerequisite.

Providing opportunities for young people in the engineering environment is high on Leago's list of priorities.

ABOUT LUVHONE ENGINEERING

Luvhone Engineering provides niche technology solutions with a focus on core engineering and ICT services for three industry sectors: aerospace and security; satellite and terrestrial broadcast solutions; and information and communications technologies.

As a 'new space' pioneer, Luvhone aims to be the preferred pan-African engineering technology partner of choice, and the inventor of solutions within aerospace, telecoms and satcoms that can be pursued for commercial use globally and shared for the prosperity of Africa and humanity.



NEW SPACE EXPLAINED

New space is a movement and philosophy encompassing, but substantially broader than the emergent private spaceflight industry. The term refers to a community of relatively new aerospace companies working independently develop faster, better, and cheaper access to space, spaceflight technologies, and space missions. New space can also be defined by the democratisation of space, which is centered on making space systems and services reasonably priced and accessible to a diverse set of new customers or market entrants.

ACCESS TO AEROSPACE SECTOR WITH AS/EN9100 CERTIFICATION

PRODUCT MARKETS:
Aviation, space and defence

TECHNOLOGY STREAMS:
Turning, milling and welding

► **BENEFICIARY:**
West Engineering (Pty) Ltd

► **PROJECT TITLE:**
AS/EN 9100 surveillance audit

West Engineering (Pty) Ltd was established to manufacture industrial machine components by turning, milling and welding operations and predominantly supports customers in the mining sector and general industries. As a world-class rebuilder of mining equipment, West Engineering, engineers, designs and manufactures alternative replacement parts for the surface as well as underground mining industry.



To gain access to the aerospace sector required that West Engineering secure AS/EN9100 certification. Funding supplied by AISI enabled an AS/EN9100 audit to be conducted.

Safety is of key importance across the entire supply chain within the aerospace industry as even the smallest of product or service flaws could have fatal outcomes. The team at West Engineering takes pride in the delivery of high precision engineering of parts achieved by using accurate CNC machines that ensure the manufacturing process renders components of consistent quality.

The AS/EN certifications have been developed by the International Aerospace Quality Group (IAQG) and the series consists of three standards: AS/EN9100, AS/EN9110 and AS/EN9120. All three standards are based on the ISO 9001 Quality Management Systems standard but adding requirements to address industry specific challenges.

The support received from AISI will help to open new markets for West Engineering and in so doing contribute to South Africa's ability to deliver on highly technical production and machining of industrial components.



MORE ABOUT ISO ACCREDITATION

ISO is the abbreviation for the International Organisation for Standardisation, a global organisation with 167 member countries. South Africa is represented by the South African Bureau of Standards (SABS).

Certification can be a useful tool to add credibility, by demonstrating that a company's product or service meets the expectations of its customers. In some industries, certification is a legal or contractual requirement. ISO does not perform certification, but rather develops international standards related to a specific certification process. Certification is undertaken by approved external certification bodies.



SMALL COMPONENT MANUFACTURER INCREASES PRODUCTION AND PROFITS



PRODUCT MARKETS:
Aviation and defence



TECHNOLOGY STREAMS:
Component supply

BENEFICIARY:
Compumach

PROJECT TITLE:
AS/EN 9100 surveillance audit

Compumach Engineering is a small CNC manufacturer of precision components that was established in 2004 to supply components to the aviation and defence industries.

The funding provided by AISI in the 2022/23 period facilitated Compumach's quality systems adherence to aerospace requirements of AS9100. An AS9100 internal audit is a process that an organisation carries out itself and provides assurance that it has met the requirements of its quality management system.

"The assistance from the AISI has ensured that Compumach is able to produce more efficiently and has resulted in us not only surviving the devastation of the Covid-19 pandemic but has also allowed us to grow by increasing our revenue by almost 16% in the following financial year," says Jessica dos Santos from Compumach. "Our ongoing relationship with the AISI is greatly cherished and we appreciate the expertise and their openness to assist us as we move forward."



ISO ACCREDITATION TO BOOST SERVICE OFFERING IN CONTRACT MANUFACTURING ENVIRONMENT



PRODUCT MARKETS:
Automotive, commercial and marine



TECHNOLOGY STREAMS:
Electronics, harnesses

BENEFICIARY:
JJ Harnessing

PROJECT TITLE:
ISO 9001 and 14001 development and implementation

JJ Harnessing is a contract manufacturing company that provides a range of services from prototyping to full production in the field of electronics and harnesses. The company specialises in the automotive, commercial and marine industries with all products built according to IPC standards, as well as fully inspected and tested to ensure customer satisfaction.

ISO 9001 and ISO 14001 certification was identified as a key business driver that would allow the company to reach new goals and grow the business. It was here that AISI played a role through the provision of funding for the development and implementation of ISO 9001 and ISO 14001 accreditation.

ISO 9001: 2015 is a quality management system that assures a customer that quality checks for a product or service offered has been properly verified.

ISO 14001 sets out the criteria for an environmental management system and maps out a framework that a company or organisation can follow to set up an effective environmental management system.



INNOVATIVE AND COST EFFECTIVE BESPOKE SOLUTIONS



PRODUCT MARKETS:
Defence and marine



TECHNOLOGY STREAMS:
Defence equipment and harnessing

BENEFICIARY:
Shrike Marine

PROJECT TITLE:
ISO 9001 certification

Shrike Marine is a flexible design house able to rapidly put together prototypes for integration into a clients' systems. Having partnered with various companies locally and abroad, Shrike Marine has been able to research and develop bespoke solutions that have proven to be innovative and cost effective.

Their focus is on systematically delivering high quality product and system design, equipment and component procurement, integrating and testing sub systems, as well as training and maintenance support. More recently, Shrike Marine has expanded in areas of high frequency, power supply and power distribution primarily for military use.

During the 2022/23 period, AISI provided funding for Shrike Marine to secure ISO 9001 certification that serves to assure customers that work undertaken is done so within an ISO compliant quality management system.



Shannon Baatjies from Shrike Marine is seen here wiring a complex loom assembly

PROGRAMME 2: INDUSTRY DEVELOPMENT AND TECHNOLOGY SUPPORT

This programme focuses on advancing production innovation such as the use of advanced manufacturing and other Fourth Industrial Revolution technologies to build more durable, compact and efficient products. Access to new and existing processes, products and methods is also facilitated to ensure that beneficiaries develop products and services that enable them to exploit multiple market opportunities. Integrators and sub-system suppliers are encouraged to include SMMEs and lower-tier suppliers in their supply chains, to enable the continuous transfer of knowledge, expertise, capabilities and technologies, thereby broadening the industrial base.

Table 3: Industry development beneficiaries during 2022/23

Beneficiary Name	Project Title
Cybicom Atlas Defence	RPAS test platform for aerial release of sterilised false codling moth
Petrawell	Filament Winding of low and high pressure vessels
Petrawell	Xenon-Ion propulsion fuel vessel demonstrator
Sentian Aerospace	Sentian UAV Optimisation
Avior Labs	Low-cost high bandwidth UAV datalink
Low-cost high bandwidth UAV datalink industrialisation	Application of additive manufacturing for the manufacture of critical aircraft parts
Etion Create	Etion autotracker development
Lightweight structures	Localisation advanced composite and EPP manufacturing technology for UAV parts



WHAT ARE TRLS?

Technology readiness levels (TRLs) are a method for estimating the maturity of technologies during the acquisition phase of a programme. TRLs enable consistent and uniform discussions of technical maturity across different types of technology.

	Basic principles observed and reported: Transition from scientific research to applied research. Essential characteristics and behaviours of systems and architectures. Descriptive tools are mathematical formulations or algorithms.	TRL 1
	Technology concept and/or application formulated: Applied research. Theory and scientific principles are focused on specific application area to define the concept. Characteristics of the application are described. Analytical tools are developed for simulation or analysis of the application.	TRL 2
	Analytical and experimental critical function and/or characteristic proof-of concept: Proof of concept validation. Active Research and Development (R&D) is initiated with analytical and laboratory studies. Demonstration of technical feasibility using breadboard or brass board implementations that are exercised with representative data.	TRL 3
	Component/subsystem validation in laboratory environment: Standalone prototyping implementation and test. Integration of technology elements. Experiments with full-scale problems or data sets.	TRL 4
	System/subsystem/component validation in relevant environment: Thorough testing of prototyping in representative environment. Basic technology elements integrated with reasonably realistic supporting elements. Prototyping implementations conform to target environment and interfaces.	TRL 5
	System/subsystem model or prototyping demonstration in a relevant end-to-end environment (ground or space): Prototyping implementations on full-scale realistic problems. Partially integrated with existing systems. Limited documentation available. Engineering feasibility fully demonstrated in actual system application.	TRL 6
	System prototyping demonstration in an operational environment (ground or space): System prototyping demonstration in operational environment. System is at or near scale of the operational system, with most functions available for demonstration and test. Well integrated with collateral and ancillary systems. Limited documentation available.	TRL 7
	Actual system completed and "mission qualified" through test and demonstration in an operational environment (ground or space): End of system development. Fully integrated with operational hardware and software systems. Most user documentation, training documentation, and maintenance documentation completed. All functionality tested in simulated and operational scenarios. Verification and Validation (V&V) completed.	TRL 8
	Actual system "mission proven" through successful mission operations (ground or space): fully integrated with operational hardware/software systems. Actual system has been thoroughly demonstrated and tested in its operational environment. All documentation completed. Successful operational experience. Sustaining engineering support in place.	TRL 9

REMOTE PILOTED AIRCRAFT SYSTEM TO BOOST SAFETY IN AGRICULTURAL SECTOR



PRODUCT MARKETS:
Defence, aerospace and naval

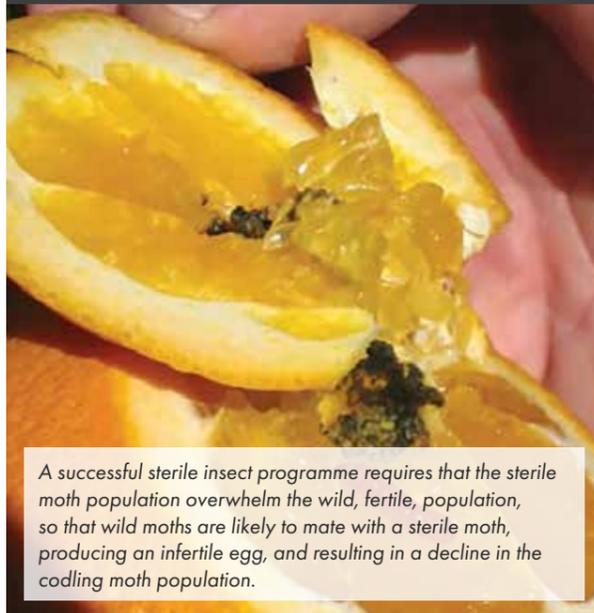


TECHNOLOGY STREAMS:
Remotely piloted aircraft system

► **BENEFICIARY:**
Cybicom Atlas Defence

► **PROJECT TITLE:**
RPAS test platform for aerial release of sterilised false codling moth

Cybicom Atlas Defence (CAD) is a B-BBEE level 1 Defence Electronics company specialising in the defence, aerospace and naval domains. CAD partnered with Bronberg Dynamics, a South African Startup company in Unmanned Aerial Vehicle Design and Manufacture, to develop a Remotely Piloted Aircraft System (RPAS) suitable for testing the aerial release of sterilised insects.



A successful sterile insect programme requires that the sterile moth population overwhelm the wild, fertile, population, so that wild moths are likely to mate with a sterile moth, producing an infertile egg, and resulting in a decline in the codling moth population.

This initiative is supported and collaborated with X-Sterile Insect Technique (XSIT), a service provider to the citrus and table grape industries, assisting with the control of False Codling Moth (FCM) using sterilised insect techniques. The FCM is considered a phytosanitary pest to most of South Africa's export markets, with over 75% of SA's citrus export markets affected, and as such, poses a huge risk to South Africa's Forex earnings.

These sterilised insects are currently being released by various methods including: hand release via ATV as well as from rotary and fixed-wing aircraft. Between 2014 and 2016, five pilots lost their lives involving gyrocopters and fixed wing aircraft while performing sterile insect release.

"We are committed to preventing the further inevitable loss of life by replacing the manned aircraft with RPAS in these extremely dangerous operations," comments Darcy Ockers, Head of Projects and Simulators at CAD "and to date we have developed novel hopping and counting devices for FCM release via different platforms."

CAD and its collaborators sought funding to develop an RPAS test platform for aerial release of sterilised insects to further industrialise future larger RPAS platforms that would be better suited commercially to effectively service the agricultural industry while minimising the risk to human life.

The project was granted AISI funding in 2021 and commenced in September that year. The initial project duration was estimated at 12 months, but unforeseen delays primarily due to South African Civil Aviation Authority (SACAA) availability to perform a demonstration to conclude the RLA process. Full SACAA approval was required to allow for the platform to be fully tested and used for improvements in order to scale up the technology. However, the team at CAD viewed the experience gained in following the process as invaluable and provided confidence in the design and production of the technologies developed.

In December 2022, the project was successfully taken through the SACAA system and by the end of the project review period all parties involved were eagerly waiting for the conclusion of the project to make further development and proving of the systems in the air possible.

Through AISI's funding, CAD was able to help two small startups in the aerospace industry. Bronberg Dynamics that designs and manufactures RPAS platforms and Greenfly Aviation, a RPAS operator in the South African space. Bronberg Dynamics further supported smaller collaborators and suppliers, such as Flying Robot, in the industry by purchasing tools, equipment and materials from this funding opportunity.

"Once the RPAS platform is completed, it will provide an invaluable tool in our quest to commercialise this technology and scale up the platform and associated hopper technology for large scale



TECHNOLOGY DEVELOPMENT AND ENHANCEMENT



PROJECT PROVIDED EMPLOYMENT FOR TWO PEOPLE



3 SMMEs INVOLVED



The remotely piloted aircraft system developed for the testing of aerial release of sterilised insects

commercial aerial release of False Codling Moth (FCM) and possibly, aerial sterilised insect release (SIR) in general," adds Ockers. "The worldwide trend towards shrinking defence budgets requires new approaches and thinking and CAD is using its niche specialised engineering skills and experience to diversify into new market sectors such as agriculture by advancing AgriTech."

CAD employs approximately 30 full time staff and three interns and bursars were involved in this project and assisted with project development. Two of these interns have been employed by CAD and have been provided opportunities to work within the naval maintenance unit of the business.

ADVANCES IN FILAMENT WINDING TECHNOLOGY TO BOOST LOCAL DEVELOPMENT AND EXPORT POTENTIAL



PRODUCT MARKETS:

Aerospace, energy, maritime and satellite



TECHNOLOGY STREAMS:

Filament winding

BENEFICIARY:

Petrawell

Petrawell is a start-up enterprise registered in 2015 that commenced composite operations in 2019. The company specialises in filament wound products and provides solutions to the aerospace, energy, and maritime industries. To date, the company has successfully developed its own filament winding software and designed, manufactured, and commissioned its own CNC machines including filament winders and profiles cutters.



Type three high pressure vessel developed by Petrawell

PROJECT 1 TITLE: FILAMENT WINDING OF LOW AND HIGH PRESSURE VESSELS

The objectives of the project funded by the AISI were to develop a functional composite filament wound cryogenic composite (low pressure) and (kerosene) high pressure vessels able to reach a holding pressure of 350 Bar with the best volumetric capacity possible. In addition, the project sought to establish local expertise and demonstrated capabilities to support South African industry with composite filament winding of pressure vessels and associated processes.

This project was undertaken over a 12-month period and comprised of three phases namely, the experimental demonstrator (ED), the advanced demonstrator (AD) and the proof of concept (POC) phases.

“We planned the project like this to allow the team to have dedicated review stages of all the processes from design to validation due to the anticipated technical challenges,” comments Wouter Gerber, Chief Research officer for Petrawell. “The project team experienced a steep learning curve regarding the technical challenges, as well as the material procurement process.”

Based on preliminary discussions with material providers and literature studies that indicated this was possible, the initial aim was to develop a type five vessel. However, it became apparent that the cryogenic compatible material required to manufacture the vessel could not be procured as the material referenced in literature is proprietary to the developers. They also experienced technical issues with clarification requests regarding the chemical compatibility of the material for intended chemical content of the vessel namely Liquid Oxygen (LoX).

“The team collectively decided to alter the design of the vessel to focus on a type four vessel approach that was a great success in that we manufactured a very light weight cryogenic vessel that not only met our expectations but also exceeded it,” emphasises Gerber. “We are excited about future commercial prospects as we have proven that the material procured will function as intended and that we did develop the necessary skills to work with these exotic materials and to manufacture these technically challenging vessels.”

The impact achieved from the AISI funding was significant in that Petrawell established advanced manufacturing techniques in working with high performance and exotic materials, as well as working relationships with international material suppliers that benefit the company on other projects as well.

Continuous collaboration with colleagues to solve technical challenges resulted in working relationships that will continue after this project. Moreover, Petrawell improved its hydrostatic testing regime to be more environmentally friendly and the amount of time required to understand the finite element analysis (FEA) process in the production of filament wound products.



TECHNOLOGY DEVELOPMENT AND ENHANCEMENT



EXPORT CAPABILITY ACHIEVED



5 SMEs INVOLVED



Petrawell's 4-Axis Filament winding machine has played a key part in the technology developments

“Productivity is synonymous with optimisation, and in this context the AISI contribution towards this project made it possible to explore more solutions than what would have been possible in terms of materials and labour,” added Gerber.

Several methodologies were designed and validated, the most promising of which will be taken forward into initial production and further studies. Support from the AISI made it possible to run several more optimisation campaigns and achieve several productivity improvements including, but not limited to, design process optimisation, as well as improvements in material procurement processes, manufacturing techniques and testing.



Filament winding is a fabrication technique mainly used for manufacturing open or closed end structures. This process involves winding filaments under tension over a rotating mandrel.

PROJECT 2 TITLE: XENON-ION PROPULSION FUEL VESSEL DEMONSTRATOR

According to the December 2021 report by Euroconsult, the international satellite industry is experiencing a radical transformation in terms of number of satellites and market value. Euroconsult anticipates that satellite demand will experience a substantial increase over the next ten years with 1,704 satellites to be launched on average every year (vs. 381 over the past decade). The report forecast a 36% increase in sustained demand from a handful of mega constellations in addition to many smaller ones.

Xenon fuel tanks for ion-propulsion can only be purchased from a few select international manufacturers and there are no local manufacturers or distributors. It is unclear as to exactly what technology these manufacturers apply as it carries heavy intellectual property restrictions. A local need for this technology was expressed by the South African satellite community during meetings held at the Conference on Competitive Manufacturing (COMA) in 2022.

The commercialisation of satellite components is not only technical, but also a supply chain challenge from dedicated, capable suppliers to the human capital requirement. The commercialisation of the South African satellite industry is only as successful as the integrated vertical and horizontal supply chain. The technical challenges need to be addressed in an effective, efficient, and collaborative manner.

International trends were attained through literature study, conferences, and virtual meetings with institutions like the Innovation Quarter in the Netherlands and Fraunhofer IST in Germany.

The goal of the project was to develop a certifiable ion propulsion fuel vessel for the domestic and international satellite market using advanced manufacturing techniques coupled with exotic material applications and creative design solutions. The project involved the development of a Type 3 vessel with a titanium liner, carbon prepreg over-wind and Xenon gas contents.

Several key objectives underpinned this development. These included a rapid, simple, and cost-effective solution to the local and international satellite market, manufacturing capability to produce a titanium lined Type 3 pressure vessel, use of the latest material science applicable to filament winding process on this project, and a series of functional objectives.

According to Wouter Gerber, "Tanks in use today are being produced using outdated technology but continue to be used because of flight heritage. We set out to improve on the performance and price of existing products by applying modern technology in both the liner system and carbon fibre over-wind structure."

"From the outset, we sought to move Petrawell from a TRL 4 component/subsystem validation in laboratory environment to a TRL 8 actual system completed and "mission qualified" supplier through test and demonstration in a ground or space operational environment," adds Gerber.

This project is aligned with major government programmes and the recommendations of recognised consulting firms. The processes developed in this project are based on the direct requirements of the partners, however, the technology is readily transferrable to complex structures including Xenon fuel tanks specifically for satellite propulsion. The importance of the project is underwritten by the steep growth in demand for satellite constellations in telecommunication, agriculture and surveillance sectors.

It also supports several AISI goals in that it has resulted in technology based supplier development, industrialisation of technologies, industry transformation and job creation.



Component/subsystem validation in laboratory environment: Standalone prototyping implementation and test. Integration of technology elements. Experiments with full-scale problems or data sets.

TRL 4



Actual system completed and "mission qualified" through test and demonstration in an operational environment (ground or space): End of system development. Fully integrated with operational hardware and software systems. Most user documentation, training documentation, and maintenance documentation completed. All functionality tested in simulated and operational scenarios. Verification and Validation (V&V) completed.

TRL 8

DEVELOPMENT OF UAV FOR LONG RANGE AND LONG ENDURANCE DATA COLLECTION PURPOSES



PRODUCT MARKETS:

Security, maritime, research, wildlife conservation, and agriculture



TECHNOLOGY STREAMS:

7-metre wingspan drone suited to multiple missions

► BENEFICIARY:

Sentian Aerospace

► PROJECT TITLE:

Sentian UAV Optimisation

Sentian Aerospace was founded in 2015 as a drone manufacturing company by a group of four friends who had the desire to do their part in improving the world. At inception, their philosophy was, and still is, to develop low-cost aerospace solutions for sustainable, green and efficient collection of valuable data. The company designs and builds unmanned aerial vehicles (UAVs) capable of delivering highly valuable video and multispectral data to customers using their airborne platform.



In 2019, Sentian Aerospace was honoured to receive an Avi Afrique Award for innovation. Seen here from left to right receiving the award are the four co-founders Muzi Dube, Edmund Moyo, Nigel Nkundhlande and Ishmael Chiremba.

"The funding provided by the AISI was for the production of the Xplorer, a 7-metre wingspan drone capable of running multiple missions," says Muzi Dube, CEO and a co-founder of Sentian Aerospace. "The funding has also been utilised to grow the team to include skills other than engineering and technical to allow us to enter the market and sell the aircraft to different markets."

The drone was designed for long range and long endurance purposes to have the necessary capability to reach beyond their customer's needs. It features vertical take-off and landing capability like a helicopter, and then transitions to fixed wing mode for long endurance flight. It is modular in design for easy transportation and storage. It can fly slowly for good data collection, but also able to fly extremely fast for delivery. Additionally, it can stop and hover in mid-air to aid in powerline inspection and search and rescue activities.

A large-scale drone such as this one can be used for several applications in the security, maritime research, wildlife conservation and agriculture industries.

Sentian Aerospace's long-term aim is to expand into other markets and to deliver other types of products such as unmanned ground vehicles and sea vehicles. This will expand the size of the company and reach a global market.

"A project of this nature brings with it a range of technical challenges and without the AISI funding, the company would not have been able to produce the prototype and work on some of the technical challenges," adds Dube. "We have learned some important technical lessons along the way, which will serve us well in the future."

From the outset, Sentian Aerospace has fostered the goal of creating jobs to improve the country in terms of the growth of the economy and as the company expands it aims to hire local, skilled young people to help the community with much needed employment opportunities.

"The technical and business challenges that the company has faced during the course of the project have led to tremendous growth within its employees and through tackling the problems encountered, we have learned new ways of production that have positively impacted the company and the staff," concludes Dube.

NEW INTELLECTUAL PROPERTY OPENS OPPORTUNITIES IN DRONES MARKET



PRODUCT MARKETS:

Commercial and industrial drones market



TECHNOLOGY STREAMS:

Affordable, high bandwidth datalink technology

► BENEFICIARY:

Avior Labs

► PROJECT TITLE:

Low-cost high bandwidth UAV datalink development and industrialisation

The use of drones for a wide variety of applications continues to grow rapidly worldwide. All drones are dependent on communication with the ground to direct flight control communication, telemetry and commands for high level functions and payload-related communications, such as video streams. Although the exact implementation of these functions may differ from one design to the other, they often result in three different transmitter/receiver systems with their associated weight, volume, antenna and power requirements along with potential interference between the systems.



Some of the commercial off-the-shelf drones utilise custom proprietary solutions consisting of single datalinks that combine telemetry and video. However, the video or payload data must usually be transmitted in reduced quality (framerate and/or resolution) due to communication bandwidth limitations. The availability of a stand-alone, low cost, high bandwidth datalink would allow UAV developers to combine the telemetry and UAV command stream critical for operation with a high-quality video stream into a single communications system, with all the advantages associated with such a compact approach.

Given the primary challenges facing commercial drone communications systems, there is a clear opportunity and advantage gained for a communication system that combines video and telemetry and that operates in the less congested sub-1 GHz spectrum.

Avior Labs and its development partners identified a newly released sub-1 GHz WiFi technology (called WiFi HaLow) that is able to offer high data rates at lower power consumption than the alternate competing sub-1 GHz radio frequency technologies (e.g. LoRa) for drones that operate at short range.

“Since the commercialisation of products offering WiFi HaLow technology is still relatively new with development kits now being introduced into the market, at the time when the project was proposed and during the project to date, there were no publicly available examples of this technology used for drone communications. This situation provided Avior Labs with an opportunity to be first to market with this technology in the drone marketplace,” says Dr Benjamin Broughton, a co-founder of Avior Labs.

The goal of this project was to develop an affordable, high bandwidth, integrated datalink system that had been tested in prototype form in a relevant end-to-end environment. Specific features were required on the aircraft and ground sides. Furthermore, the combined system was required to be compliant with ICASA regulations in terms of operating frequency and transmission power and both the airborne and ground station systems should be packaged in suitable enclosures.

For this project, a newly developed off-the-shelf datalink chip was combined with an existing processor chip and integrated into a single system that could interface with ArduPilot-based autopilots, along with video camera systems that produce either analog or digital video output. The purpose was to provide an affordable datalink solution to drone developers that combine the telemetry, command, and payload functions into a single link, thereby saving mass, onboard space, and cost.

The link was required to provide high bandwidth communications to deal with the large volume of data over relatively short ranges. This requirement is typical for drone survey applications, that form a large proportion of the global commercial drone market.

Over the course of this project, the team successfully demonstrated a prototype system in a relevant end-to-end environment by flying



TECHNOLOGY DEVELOPMENT AND ENHANCEMENT



4 SKILLED JOBS RETAINED



2 SMMEs INVOLVED

the system on a fixed-wing unmanned aircraft and demonstrating its functionality as integrated with an ArduPilot-based autopilot and two different video cameras. The system met or exceeded all performance targets. In addition, the team intends to develop the system further as a commercial product.

KEY PROJECT OUTCOMES

The project has been paramount in assisting the company in developing new intellectual property, which increases its value and opens new opportunities. Once the datalink is commercialised, it will allow Avior Labs to provide a diversified set of products increasing the company's sustainability and reducing operational risks. Successful development of the datalink will allow the company to enter new market segments that fall outside the core market of the company i.e. aerospace and the final product will be used in the UAVs designed and developed by Avior Labs itself.

From an AISI perspective, development of the integrated small datalink as part of this project will realise the improvement of the local industry competitiveness; increased contribution of SMMEs in the economy; raise the levels of direct investment in defined priority sectors; increase market access opportunities for the export of South African goods and services; contribute towards building skills and technology platforms; and enable new suppliers to enter the supply chain and develop new technologies, industries and SMMEs, in order to enable market entry and global competitiveness through access to national expertise and infrastructure.

A focus on skills and human capital development resulted in a female student participating in the project as an intern. This involvement contributed to her pursuit of an MEng in Electronic Engineering at the University of Pretoria specialising in flight control.

Since the success of this project clearly confirmed the technical viability of the developed product, the next phases will focus on production refinements and its commercialisation. Once commercialised, a new production line will be set up creating positions for at least two skilled technicians, assuming low volume initial production, and increasing the number of employment opportunities as production is scaled up.

“Successful completion of the project and progress towards phase two will assist in building Avior Labs’ reputation as a specialist in the industry with a strong capability to deliver. Such a reputation is extremely valuable when approaching potential investors and securing the funding necessary to grow the company,” adds Broughton.

BACKGROUND TO AVIOR LABS

Avior Labs (Pty) Ltd was launched at the beginning of 2019 with the mission to apply technical and scientific innovation in developing unmanned and autonomous aerial vehicles and provide expert advice in the aeronautical industry.

The company strives to develop innovative products to uplift and better society using emerging technologies in the aerospace sphere. Avior Labs specialises in the development and manufacture of highly efficient commercial unmanned aerial vehicles, associated technologies, and software. Its goal is to connect its co-founders’ and associates’ mathematical, scientific, and engineering knowledge with societal needs to produce products that solve everyday problems in efficient and cost-effective ways. In this context, the company’s focus is on creating UAV solutions applied in the conservation, health, agricultural, built environment, security, and humanitarian domains.



Datalinks will be packaged for retail purposes. Each package will contain two Pyxis units, antennas, a manual and a collection of pre-made cables to connect to different types of devices.



The housing is 3D printed from high strength nylon that offers a quality solution.

STANDALONE AUTOTRACKING SOLUTION TO ENHANCE SERVICE OFFERING BY LOCAL SUPPLIER



PRODUCT MARKETS:

Aerospace, defence, industrial, rail and cybersecurity sectors.



TECHNOLOGY STREAMS:

Stand-alone video autotracking

BENEFICIARY:

Etion Create

PROJECT TITLE:

Etion autotracker development

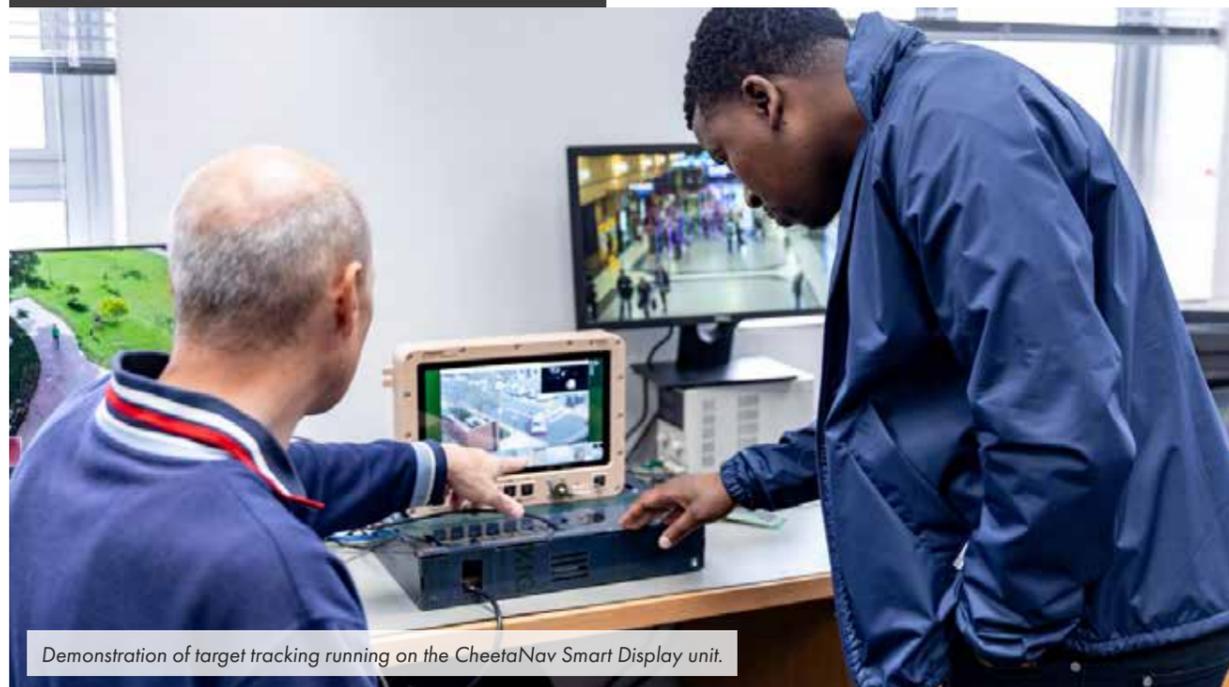
Situational awareness is a key component in the deployment of forces in an operational environment and video cameras are widely used. Image stability, especially in targeting applications, is critical to ensure the accuracy of positioning information and to ensure the targets are not lost due to relative movement of the platform or targets. This type of functionality also assists with identification of objects targeted in the field of view.

Video autotracking functions are therefore built into video-based surveillance and targeting systems. Whilst there are companies both locally and internationally that provide video autotracking capabilities, these companies either provide autotrackers integrated into their higher-level hardware assemblies/sub-systems (cameras and mission computers) or as licenced executable software that is dependent on an existing Operating System (OS), such as Linux, being installed on the target platform (international).

Locally, the companies that provide autotrackers do not provide standalone solutions, but rather integrated functionality in their sighting systems. ETION was approached by various existing clients to investigate the feasibility of providing standalone autotracking functionality.

During this investigation it was found that that the only options available were to either purchase software from a foreign company that comes with a hefty price tag or to purchase complete hardware solutions for resale to their clients, thus negating the original request to enhance existing products to our clients. A further advantage of developing an autotracker solution was the fact that it would form a key part of the ETION roadmap toward the development of a Battle Management System (BMS) using products developed in-house at ETION Create.

The goal of the project that ETION Create sought funding from the AISI for was to develop a local video tracking solution (autotracker) that can run on small, embedded platforms or on a Linux based operating system that is not International Traffic in Arms Regulations (ITAR)



Demonstration of target tracking running on the CheetaNav Smart Display unit.



NEW TECHNOLOGY DEVELOPMENT



3 SKILLED JOBS RETAINED



1 PERSON TRAINED

controlled and can be provided as a standalone solution without the need for extensive proprietary integrated video systems.

“An analysis of the market indicated that there are various local, as well as international clients that would be interested in this solution,” comments Jaco van Heerden from ETION Create “Especially if they can avoid solutions from international companies whose products are international traffic in arms regulations controlled, restrictive and prohibitively expensive.”

By using the tracking algorithm identified, it was possible to implement an autotracker with acceptable performance on resource constrained HW ideal for embedded applications. Evaluating the autotracker against well-known benchmark data sets yielded very good results. The project was completed within the stipulated timeframe and below the budgeted cost, with the project goal and all objectives successfully achieved.

The outcome of the project improves potential local market growth, adds to the Cheeta Smart Display functionality thereby creating

opportunities for local manufacturing (of integrated embedded solutions), and provides locally available tracker libraries that can be used by local companies and integrated into other embedded systems.

“The successful completion of this project has resulted in the establishment of an autotracker development capability in South Africa that was not previously available,” concludes Van Heerden.

ABOUT ETION CREATE

ETION Create is an original design manufacturer that designs, develops, and manufactures a wide range of advanced electronic and embedded solutions as well as digital products for different markets. The company has a long-standing reputation for delivering excellence in the aerospace, defence, industrial, rail and cybersecurity sectors.

ETION Create is ISO 9001 certified and offers solutions to complex and challenging engineering and manufacturing requirements in defence and aerospace, mining and industrial, cybersecurity, and rail solutions.



The Etion Create team from left to right: Jaco van Heerden, Leon Theunissen, Douglas Healy, and Phenyong Mongale.

LOCALISATION OF A COMBINED ADVANCED COMPOSITE AND EPP MANUFACTURING TECHNOLOGY FOR UNMANNED AERIAL VEHICLE (UAV) STRUCTURAL PARTS



PRODUCT MARKETS:
Aerospace, maritime and medical



TECHNOLOGY STREAMS:
Composites and expanded polypropylene (EPP)

► **BENEFICIARY:**
Lightweight Structures

► **PROJECT TITLE:**
Localisation advanced composite and EPP manufacturing technology for UAV parts

When it comes to heavier-than-air-machines – weight is paramount. Since man first took to the skies designers have sought to improve lift to weight ratios and composite materials have played a major part in weight reduction. They are versatile and used for both structural applications and components in all aircraft and spacecraft.

An unmanned aerial vehicle (UAV), commonly known as a drone, is an aircraft without any human pilot, crew, or passengers on board. Whilst UAVs are widely used for a range of purposes including aerial photography, precision agriculture, forest fire and river monitoring, policing and surveillance, infrastructure inspections, product deliveries and entertainment, they are playing an increasingly important role in the future of aviation, especially in military applications.

However, as drones tend to be smaller than conventional aircraft and with a limited fuel capacity, their flight times tend to be significantly lower than those of their manned counterparts. The issue becomes even greater when considering the payload of the vehicle.

To improve this, a reduction of weight in the aircraft is critical and as a result, composite materials take a central role in the design and manufacture of UAVs.

Lightweight Structures is an ISO 9001 certified advanced composite products manufacturer. Since its establishment 25 years ago, the company has become one of just a few in South Africa that specialises in the manufacture of aerospace-qualified composite parts and structures used by some of the well-known global aerospace companies, maritime companies, and medical equipment manufacturers. They produce components from glass, Kevlar, and carbonfibre materials, utilising both traditional and advanced technologies such as the use of pre-impregnated fibres and resin-transfer manufacturing.

“We received funding from the AISI during the review period for the localisation of a combined advanced composite and EPP



Extensive in-house training capacitates staff with the knowledge required to manufacture parts from composite materials



TECHNOLOGY DEVELOPMENT AND ENHANCEMENT



IMPORT SUBSTITUTION ACHIEVED



4 SMMEs INVOLVED

manufacturing technology for Unmanned Aerial Vehicle (UAV) structural parts,” comments Elena Broughton from Lightweight Structures “and we are the first company in South Africa that has developed and demonstrated the technology to manufacture UAV airframes from a combination of composite materials and EPP.”

To understand the value of this project, it is important to gain an understanding of what composite materials and EPP are.

Composites are materials made by combining two or more natural or artificial elements, with different physical or chemical properties, that are stronger when combined than when used individually. The component materials don’t completely blend or lose their individual identities, they combine and contribute their most useful traits to improve the outcome or final product. Composites are typically designed with a particular use in mind, such as added strength, efficiency or durability.

Expanded Polypropylene (EPP) is a highly versatile closed-cell bead foam that provides a unique range of properties, including outstanding energy absorption, multiple impact resistance, thermal insulation, buoyancy, water and chemical resistance, exceptionally high strength to weight ratio and 100% recyclability. The manufacturing process is complex, requiring both technical expertise and specialised custom equipment.

Polypropylene resin is combined with other ingredients in a multi-step proprietary process to become consistently shaped beads of

expanded polypropylene foam. Other specialised manufacturing techniques may be employed to produce variations in the final product form. EPP foam beads are then injected into moulds and a combination of pressure and steam heat fuse the beads into a finished shape. The finished EPP foam part becomes a key component in sub-assemblies incorporated in the original equipment manufacturer’s product.

“EPP technology offers three main advantages,” adds Broughton. “The developed UAV airframe is lighter improving its endurance, the manufacturing of the airframe is less than half of the conventional method of manufacturing and the production is more cost-efficient increasing the competitiveness of the manufactured UAV.”

The technology puts Lightweight Structures at the forefront of UAV airframe manufacturers in South Africa. This bridges the gap between the UAV manufacturing capabilities of the developed world and developing countries such as South Africa. The localisation of this technology in South Africa creates an opportunity for the development and growth of the domestic UAV manufacturing industry that can serve both international and local original equipment manufacturers (OEMs).



The Elevation UAV airframe from Avior Labs (Pty) Ltd was chosen as a technology demonstrator to develop and implement the new manufacturing technology developed. The same technology can easily be adapted to most UAV airframes that are in the small – medium category with a maximum wingspan of around three meters.

Table 5: Technology enhancements – Marine

Beneficiary Name	Project Title
Skye Advance Africa	Development of a hull section using high modulus composite components
Symbytech	Argonot

UNMANNED SUBMERSIBLE ROBOT SET TO REVOLUTIONISE HULL CLEANING AND INSPECTION IN MARINE ENVIRONMENT

PRODUCT MARKETS:
Maritime industry

TECHNOLOGY STREAMS:
Robotic technology for hull cleaning and underwater inspections

BENEFICIARY:
Symbytech

PROJECT TITLE:
Argonot

assist in developing a minimum viable product to serve as the entry level commercial product. The second key objective was to reach commercial contract phase that required a working product for demonstration purposes.

The strategic nature of the project is to take a first-time technology for South Africa and turn it into a product that can be used in services for both national and international use. To enhance Argonot's technologies, SymbyTech partnered with various service providers in the areas of software development, mechanical and electronics engineering, as well as members in and out of the marine sector to test and trial Argonot.

"From day one, the main objective has been to develop a product that meets strict global standards (BIMCO / Glofouling / IMO) and attains the approval of the respective authorities such as the International Association of Classification Societies (IACS)," adds Du Toit.

"Argonot will serve as a new competitor within the sectors it services and through the funding provided by the AISI marine programme we have been able to focus on product development that will ultimately assist in providing access to local and international markets."

Looking to the future, through this project Symbytech aims to advance skills through internships and creating opportunities for students to gain exposure, job creation in the engineering fields of software, mechanical, electronics (mechatronics), as well as operator / technician training and employment. SymbyTech is also establishing partnerships with academic institutions and Saldanha Bay IDZ's drone academy.

"The successful outcome of this project will further enable South Africa's maritime, renewable energy, shipping and oil & gas sectors through attracting a larger audience for services such as hull cleaning and underwater inspections providing a much-needed boost to economy and with the support that has been provided by the AISI, this is within reach," concludes Du Toit.



Biofouling is a significant problem for all vessel owners and operators. It increases the drag on a vessel that negatively impacts fuel consumption and places increased strain on the drive system. This results in higher operating costs and environmental impacts caused by the greenhouse gas emissions (GHG). What's more, invasive species transported on a vessel's hull increases the risk to our marine food security.

Symbytech is an innovative technology solution provider in the asset integrity sector and since 2018 has been designing a sustainable solution, known as Argonot.

"Argonot is an unmanned robotic vehicle that is being developed to support the maritime industry in the reduction of invasive species distribution, reduction of GHG, improving on asset integrity, enabling the benefit of fuel savings and improved corporate responsibility in reaching the United Nations Sustainable Development Goals," emphasises Grant Du Toit from Symbytech.

When SymbyTech applied to the AISI for funding support, Argonot was at technology readiness level (TRL) 4 and the goal was to take Argonot to a working product. This involved the achievement of two key objectives.

The first of these was to conduct tests and trials on the existing prototype that required a series of dry and wet tests that would

COMPOSITE MANUFACTURING TO BENEFIT SOUTH AFRICAN WORKBOAT MARKET

PRODUCT MARKETS:
Marine

TECHNOLOGY STREAMS:
Composite manufacturing

BENEFICIARY:
Skye Advance Africa

PROJECT TITLE:
Development of a hull section using high modulus composite components

There is a large gap in the South African market for workboats, especially smaller vessels less than nine metres in length. Skye Advance Africa aims to fill this space using composite manufacturing that allows for new product development, as well as innovation and growth. The company has been able to prove that the South African supply chain is able to supply the materials, at the required international standards, to manufacture high modulus composite workboats.

"We take immense pride in our commitment to building in Africa for Africa and place extensive emphasis on skills development, adds Niske. "Of the eight people employed by the company, four are disadvantaged youth from the local community and we have found that although they come from difficult conditions, their ambition and willingness to learn is a driving factor for them to consistently do better."

At Skye Advance Africa, meticulous attention to detail begins with the design and plug development process. Their skilled design team collaborates closely with clients, taking their specific requirements into account. Utilising advanced software and 3D modelling techniques, they create innovative designs that optimise efficiency and performance.

Their ethos is to provide boats built in a clean, safe, and environmentally friendly manufacturing facility and to ensure they provide staff and boat builders with the necessary skills and training to work to the highest standards. It is with this mindset that they are pursuing the establishment of a composite training centre that will give staff, not just suitable training, but also a certification of competence.

Looking to the future, Skye Advance Africa is involved with promising projects that include developing tooling for a national government entity in the country, as well as the development of tooling for an international client that is looking for an alternative to aluminium / steel production server housings.

"In the marine industry, composite materials have emerged as a game-changer, offering superior strength, durability, and weight advantages over traditional materials like aluminum," comments Ewin Niske from Skye Advance Africa, "by infusing resin into a dry reinforcement stack under vacuum pressure, we are able to create workboats that are not only lighter, but also possess exceptional structural integrity."

Funding supplied by AISI during the 2022/23 period allowed for the development of a hull section using high modulus composite components. This is not the first time that Skye Advance Africa has benefited from AISI involvement. In 2021, under the guidance of the CSIR and AISI, the company investigated how local glass fibre and resin combinations in composite building, using high modulus vacuum infusion compares to aluminum and the results were very promising. Skye Advance Africa has moved into a manufacturing centre and started to develop its own workboat, the Skye 10 Series. It is being designed to operate in shallow waters at high speed when required, making it well suited to the African market ranging from ferries and patrol boats to fishing boats.



Composite materials have emerged as a game-changer in the marine industry as they offer superior strength, durability, and weight advantages over traditional materials like aluminum.

PROGRAMME 3: SECTOR STRATEGIC SUPPORT INITIATIVES

The AISI implements, oversees and contributes projects of national interest through this programme. This includes the development of the Commercial Aviation Industry Development Strategy, the hosting of the Joint Aerospace Steering Committee and contributing to the development of the Aerospace and Defence Masterplan, both at operational and strategic levels.

LOCAL DEVELOPMENT OF 3D TECHNOLOGY IN FREQUENCY MODULATED CONTINUOUS WAVE SURVEILLANCE RADAR



PRODUCT MARKETS:
Security and coastal surveillance



TECHNOLOGY STREAMS:
3D surveillance radar

BENEFICIARY:
Reutech Radar Systems

PROJECT TITLE:
3D technology establishment for the RSR906 surveillance radar

Reutech Radar Systems (RRS) was established in 1987 and over its 35-year history has grown from a fledgling enterprise into an innovative radar design and manufacturing centre. The company has progressively grown its research and development capability and today supplies a wide range of search and tracking radars and radar components to the South African National Defence Force, foreign defence forces and the security industry, as well as movement surveying radars and ground penetrating radars for the mining industry.

Funding provided by AISI during the 2022/23 period was utilised to establish 3D technology capability for the RSR906F frequency modulated continuous wave (FMCW) surveillance radar.

“Whilst the funding supplied by AISI has contributed extensively to the development of 3D surveillance radar technology for applications in the security and coastal surveillance market, the support has realised a series of important objectives for RRS,” comments Claude Ramasami, Senior Project Manager at Reunert Radar Systems.

“These include the development of partnerships and capabilities with the local SMME industry, project exposure for three SMME employees and five engineers from RRS, as well as boosting local manufacturing expertise,” he adds.

Once the development of the 3D surveillance radar has been completed, the project will progress to production status. The findings from this project will be used as a basis for future 3D surveillance radar development. RRS aims to be a leading provider of 2D and 3D radars in the developing world.

RRS employs more than 200 people, many of whom have been part of the organisation since it was established 35 years ago. Most are highly skilled and qualified specialists whose innovative solutions keep the enterprise at the forefront of its field not just locally, but internationally too.

As a proudly South African company, RRS is one that illustrates that technology and innovation remains alive and well in the country.



NEW PROCESS DEVELOPMENT



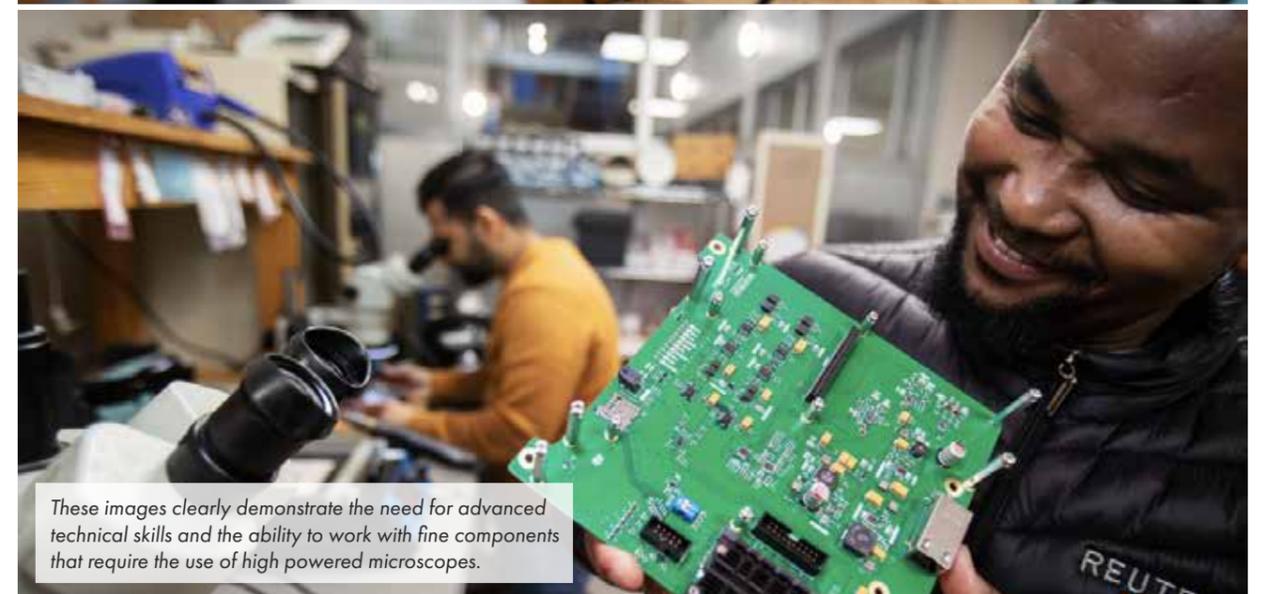
COST EFFECTIVE AND COMPETITIVE EXPORT CAPABILITY ACHIEVED



TECHNOLOGY ENHANCEMENT

FREQUENCY MODULATED CONTINUOUS-WAVE RADAR EXPLAINED

Frequency Modulated Continuous Wave (FMCW) radar is a special type of radar sensor that radiates continuous transmission power like a simple continuous wave radar. The technology can measure very small ranges to the target and simultaneously measure the target range and its relative velocity. This type of system offers a very high accuracy of range measurement and the signal processing after mixing is performed at a low frequency range that simplifies the realisation of the processing circuits. It can only be technically possible with these changes in the frequency.



These images clearly demonstrate the need for advanced technical skills and the ability to work with fine components that require the use of high powered microscopes.

PROGRAMME 4: SECTOR-WIDE ACCREDITATION

This programme assists the broader advanced manufacturing industries including marine to enhance their visibility within local and global supply chains and increase their competitiveness.

Table 4: Standards and accreditation projects – Marine

Beneficiary Name	Project Title
Trewfit Controls	IECEX and ATEX certification (for valve positioning indicators)
Nkosi Phendule Projects	SAQCC PA1 paint application course
Dormac	Welding procedure specification (WPS) qualification and endorsement, as well as welder testing and qualification by an International Association of Classification Societies (IAVS) member
Sandock Austral Shipyards	Non-destructive testing (NDT) accreditation (meeting the requirements of ISO 9712)
ProStar Paint	1. ISO 17025: 2017 development and implementation 2. Antifouling system paint type approval
Channel Marine and Trading	Non-destructive testing (NDT) training and certification (meeting the requirements of ISO 9712)
Jokwa Marine	1. Design and development of manuals, policies, procedures, work instructions, forms and templates 2. Review of existing procedures to meet the IMCA guidelines requirements 3. Communication
Abdallah Auto and Engineering	International Association of Classification Societies (IACS) approved welding certification services
Surcotec	Thermal metal spray procedure qualifications (according to IACS)
Carbontech	American Bureau of Shipping (ABS) type approval

CERTIFICATION TO SUPPLY EQUIPMENT PARTS FOR USE IN POTENTIALLY HAZARDOUS LOCATIONS

PRODUCT MARKETS:
Valve and automation industry

TECHNOLOGY STREAMS:
Precision CnC milling and turning

▶ **BENEFICIARY:**
TrewFit Controls

▶ **PROJECT TITLE:**
IECEX and ATEX certification (for valve positioning indicators)



TrewFit Controls designs and manufactures products for the valve and automation industry. With their state-of-the-art equipment, the company manufactures valve positioners, valve position indicators, Piezo pilot valves, severe service proximity switches, mounting accessories for various valves and actuators and offer custom manufacturing of engineering work requiring precision CnC Milling and Turning.

TrewFit's core products revolve around the monitoring and controlling of valves used in marine, mining, manufacturing, food and beverage production processes. The products range from commodity items to high-end value add. The range includes products that are industry



**EXPORT CAPABILITY
ACHIEVED**

firsts. The company works closely with valve manufacturers to sell and distribute their products.

When electrical equipment is used in a potentially hazardous location, for example, one that contains flammable gases, vapours, liquids, dust, or fibres the potential for fire or explosion must be minimised. One way to do this is to use equipment that has been certified as suitable for that environment and not likely to initiate a fire or explosion.

In the European Union, equipment to be used in hazardous locations is certified according to ATEX directives, which comes from the description of the hazardous materials in question, as written in French – “Appareils destinés à être utilisés en Atmosphères Explosives.” The translation into English reads, “Devices intended for use in explosive atmospheres.”

The South African National Accreditation System (SANAS) is the official accreditation body for South Africa. During the previous financial period, Trewfit Controls successfully achieved ATEX and SANAS accreditation standards.

In other parts of the world, certification is typically done according to the International Electrotechnical Commission Explosive (IECEX) system. IECEX is the IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres. It uses quality assessment specifications that are based on International Standards prepared by the International Electrotechnical Commission (IEC).

The funding provided by the AISI enabled TrewFit Controls to secure IECEX Certification for Valve Positioning Indicators. What this means is that TrewFit Controls has successfully secured IECEX, ATEX and SANAS certification for valve positioning indicators and for hazardous area products. The company is now also a certified manufacturer under these standards and can offer a complete product with appropriate protection codes.

Without certification Ex equipment usually needs to be tested again and re-certified to the acceptable standards, which will add to the equipment cost. By contrast, the IECEX scheme considerably decreases the need for re-testing and certification procedures by harmonising and conforming to international standards. As a result, international trade is made easier, faster, and more economical. IECEX certification can be utilised to support national compliance, thus averting the need for further testing in most cases. This means TrewFit Controls can now manufacture the equipment and ship it.

Managing Director for TrewFit Controls, Adrian Penning, says the AISI certification project was a valuable exercise. “We have been engaging new markets and now that we have the necessary certification we are starting to get the enquiries. I believe a lot of these will turn to orders as customers and our distributors have been asking us about such products over the years, and we have had very positive feedback. This adds to our basket of products and we expect orders and business on that side.”

“This certification is recognised globally and gives us a boost in bringing South Africa forward in meeting world-class safety and industrial standards, especially working in hazardous and explosive atmospheres,” adds Penning. “TrewFit Controls is grateful for the opportunity provided by the AISI, as the support received from them has been able to secure certifications that we may only have been able to do in three to four years’ time, depending on company performance.”



The CE and ATEX certification secured by Trewfit Controls assures customers that valve positioning indicators are safe for use in potentially hazardous situations.

SAQCC ENDORSED PAINT APPLICATORS TRAINING TO BOOST SMME'S SERVICE OFFERING IN MARINE ENVIRONMENT



PRODUCT MARKETS:
Marine



TECHNOLOGY STREAMS:
Repairs and mechanical maintenance

BENEFICIARY:
Nkosi Phendule Projects

PROJECT TITLE:
SAQCC PA1 paint application course

Nkosi Phendule Projects was established in 2014 by Simthembile Kave, a marine engineer, and his brother Buntu Kave. The company provides a range of products and services including ship and tug repair and fabrication, painting, blasting, high pressure washing, pumping of tanks and bilges, tank cleaning and painting, non-destructive testing, as well as other marine and mechanical maintenance and services.

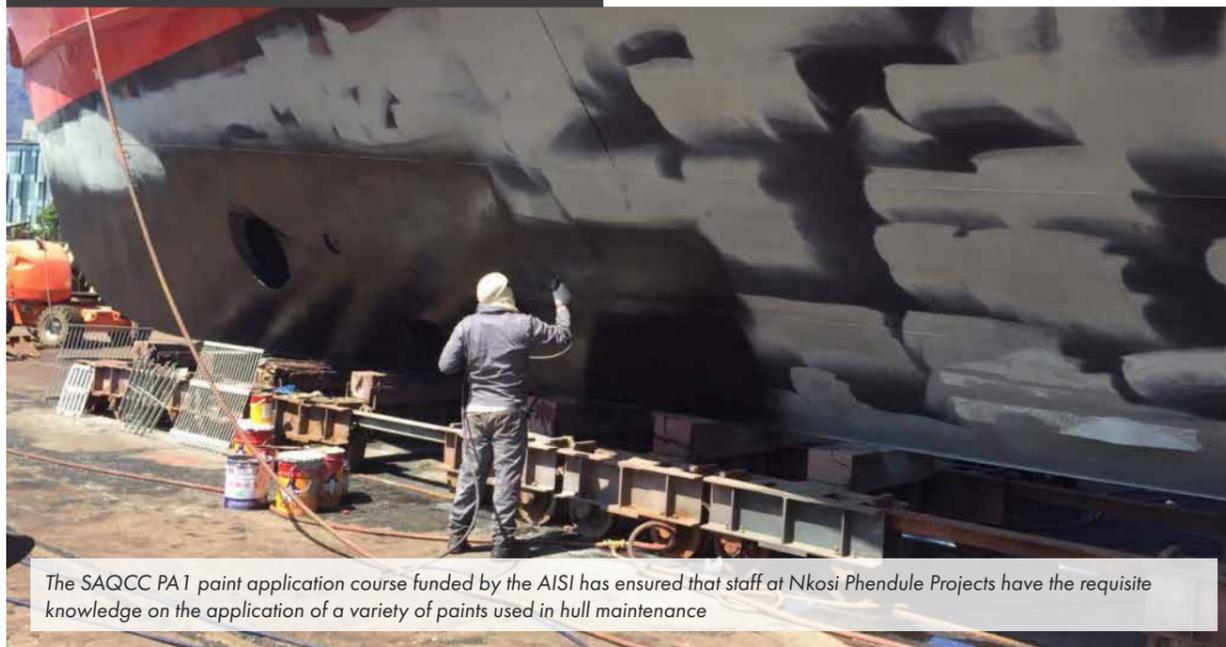
In 2021, Nkosi Phendule applied for AISI support to gain marine chemist training and accreditation to work in confined spaces, which they subsequently achieved. This allows this Black- and youth-owned SMME to conduct testing of tanks and equipment to declare these safe before commencing any work.

Subsequently, in 2022, the company applied for AISI funding for four employees to attend the South African Qualification and Certification Committee for Corrosion (SAQCC) Endorsed Paint Applicators training (PA 1 - Painting and Blasting). The scope of the training included hand and power tool surface application, surface preparation, hand application by a brush and roller, abrasive blasting surface preparation, airless spray application, as well as conventional spray application.

In the previous AISI impact report, Nkosi Phendule's spokesperson Obakeng Molelu, a marine scientist, said: "Being part of this project has been invaluable, especially for our staff who come from disadvantaged communities in and around Cape Town. They have felt empowered by being able to demonstrate their knowledge of safe working practices in confined spaces. We learnt that safety requires teamwork and trust!"

The completion of the SAQCC endorsed PA 1 - Painting and Blasting paint applicators course has further empowered the company and its staff with skills and knowledge required in the marine environment.

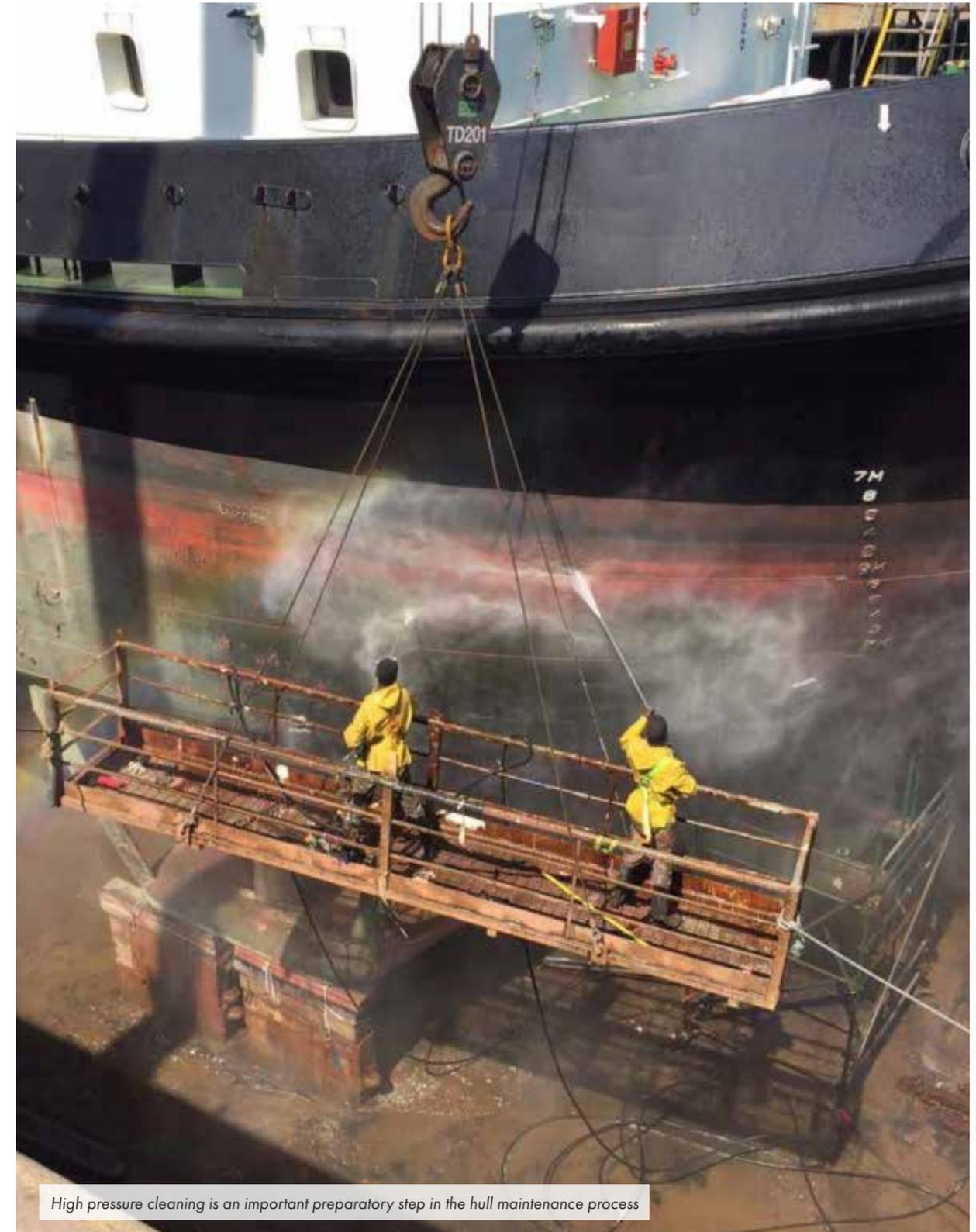
"We are extremely grateful to the AISI for its funding support over the last two years for the training undertaken by Nkosi Phendule staff as it demonstrates our commitment to the supply of services by operators who have secured the relevant training and accreditation in line with local and international minimum standards and positions the company in positive light," concludes Molelu.



The SAQCC PA1 paint application course funded by the AISI has ensured that staff at Nkosi Phendule Projects have the requisite knowledge on the application of a variety of paints used in hull maintenance



STANDARDS AND ACCREDITATION SUPPORT



High pressure cleaning is an important preparatory step in the hull maintenance process

CAPACITATION IN EXOTIC MARINE WELDING TO DEVELOP SERVICE OFFERING



PRODUCT MARKETS:
Marine, offshore and industrial



TECHNOLOGY STREAMS:
Wide range of turnkey solutions, including welding

BENEFICIARY:
Dormac

PROJECT TITLE:
Welding procedure specification (WPS) qualification and endorsement, as well as welder testing and qualification by an International Association of Classification Societies (IACS) member

The International Association of Classification Societies (IACS) is dedicated to safe ships and clean seas. The organisation makes a unique contribution to maritime safety and regulation through technical support, compliance verification and research and development. More than 90% of the world's cargo carrying tonnage is covered by the classification design, construction and through-life compliance rules and standards set by the eleven Member Societies of IACS.

IACS International Association of Classification Societies

As is the case with technical and design development across most technology markets, more sophisticated technology is being built into marine vessel design. Additionally, older vessels need to be upgraded, especially to comply with environmental performance expectations. The welding procedures that have served the marine industry well for many years, have had to be updated to comply with international expectations.

The more exotic procedures used to be sub-contracted to specialist welding contractors, but are now more the norm, and requires in-house capabilities to provide the service delivery levels required by the shipping industry.

Dormac is a leading engineering company specialising in the delivery of full turnkey solutions to clients in the marine, offshore and industrial industries. In 2021, Dormac applied for AISI support to develop its exotic ship repair capabilities. The application covered seven welding procedure specifications including, stainless steel, SuperDuplex, aluminium, carbon steel, cast steel to carbon steel, anchor chain IACS Grade, and cunifer pipe.

Dormac's safety, health, environment and quality manager Dave Swinburne says: "Dormac has been planning on securing IACS welding certification for some time in these exotic steel applications, but costs to achieve the certification made it difficult. The AISI support helped us to pursue these qualifications, which would enhance our local capabilities and encourage owners and operators to bring their vessels to the South African ports for service and dry docking."

"Since Dormac has internal expertise in managing quality assurance and quality control, it decided to manage the entire process itself, liaise with the various role players and ensure completion of each project phase. Bureau Veritas fulfilled the role of Classification Society and IACS member society, with the primary role of reviewing the material and consumables employed as well as the procedure qualification; testing and approvals are carried out according to the relevant rule note requirements," adds Swinburne.

"Dormac has a history of commitment to training and development of personnel and places emphasis on the importance of increased technical capabilities and skills not only for the company itself, but to develop young people and capacitate the industry with the skills it needs," says Swinburne "and with the support provided by the AISI, we are able to increase our access to the market, as well as broaden and improve our service offering to our clients."



STANDARDS AND ACCREDITATION SUPPORT

Welding Procedure and Qualifications Being Pursued

1. Stainless steel 316L (low carbon, corrosion resistant steel)
2. SuperDuplex 2507 (stainless steel pipe)
3. Aluminium 5083 (sheet)
4. Carbon Steel EH 36 (low carbon steel plate) to Stainless Steel 316L
5. Cunifer pipe (copper nickel pipe mainly used in seawater for anti-corrosion)
6. Cast steel to carbon steel
7. Anchor Chain IACS Grade 3



CERTIFICATION IN NON-DESTRUCTIVE TESTING ENHANCES SERVICE CAPABILITIES



PRODUCT MARKETS:
Marine, defence and aerospace industries

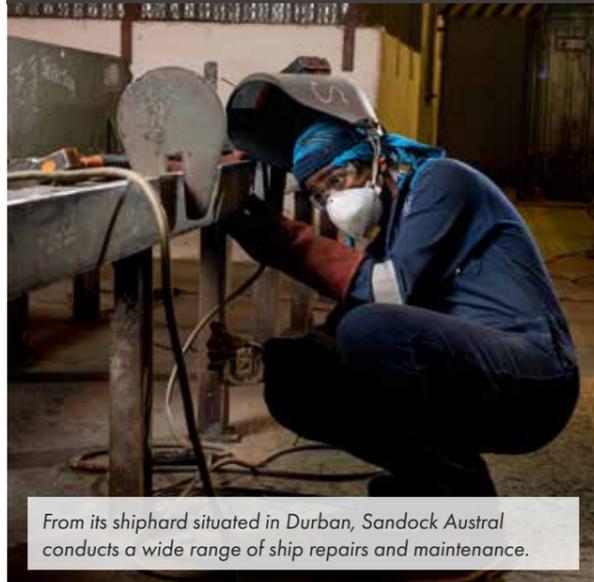


TECHNOLOGY STREAMS:
Engineering services

► **BENEFICIARY:**
SanDock Austral

► **PROJECT TITLE:**
Non-destructive testing (NDT) accreditation (meeting the requirements of ISO 9712)

South Africa's successful development of world-leading defence, commercial and industrial solutions and products has been driven over many decades of investment into training, development and research. This has resulted in the creation of some of the world's most renowned technology products, supported by experienced local scientists, engineers, technicians and operators in the defence and commercial sectors.



From its shipyard situated in Durban, Sandock Austral conducts a wide range of ship repairs and maintenance.

However, over the last decade, the pressure experienced by the South African fiscus has had a negative impact on government-led research and development investment, resulting in numerous companies scaling down, consolidating or even shutting down.

SanDock Austral identified a gap in the market for specialised sub-system technologies that remained a key requirement for both local and regional security forces for the purposes of defence capability rejuvenation and through-life support. Working from the ground up with Tier 1 & 2 entities as a strategic intermediary, SanDock Austral focused on building its own technology base through development projects of specialised technology products.

With its sights set on becoming a leading naval and commercial shipbuilding and repair yard in Africa and the near East, SanDock Austral sought financial support from AISI during the 2022/23 financial period to secure non-destructive testing (NDT) accreditation to meet the requirements of ISO 9712. The funding has enabled the company to conduct magnetic particle testing, ultrasonic testing, radiograph testing and liquid penetrant testing internally. Each of these processes were previously outsourced.

"The funding provided by AISI has significantly increased our capability to service the market and this in turn benefits the company, its employees, the community in which we operate and ultimately the country," emphasises Don Khumalo, Head of Governance and Enablement for SanDock Austral.

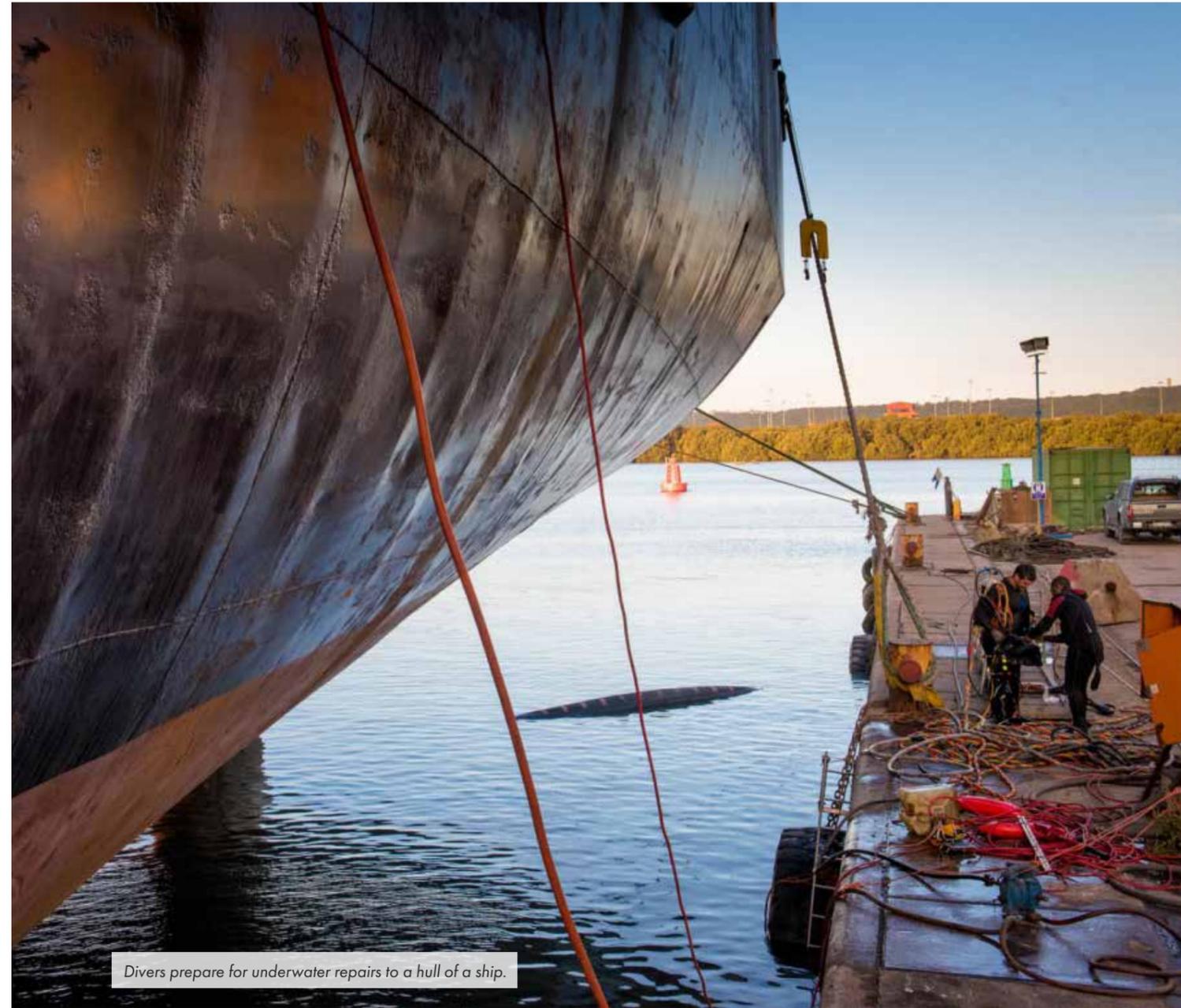
Commenting on SanDock Austral's operational model, Don Khumalo says: "at SanDock Austral we seek to harness available local talent, which has been responsible for the development and industrialisation of cutting-edge intellectual property and to consolidate it into a sizeable transformed defence and commercial technology company. We maintain the highest standards of engineering excellence that the South African products are known for, whilst embracing transformation imperatives."

ABOUT SANDOCK AUSTRAL

With a history spanning almost 50 years, SanDock Austral is an African leader in the marine, defence and aerospace industries, with a reputation for developing and delivering integrated solutions for commercial and defence engineering/technology projects. The company employs 390 people and is the largest black-owned defence company in South Africa, both in terms of revenue and facilities owned. From an accreditation perspective, the company is ISO 9001:2015, ISO 14000 and ISO 45000 compliant. In addition, it has ARMSCOR Security Clearance.



STANDARDS AND ACCREDITATION SUPPORT



Divers prepare for underwater repairs to a hull of a ship.

As part of its core philosophy of conducting business for the greater good, the company formed the SAS Cares Foundation. SAS Cares is a business and skills development, experience and exposure based non-profit organisation driven by a culture of cooperation, collaboration and sharing. It is driven by a passion for combining both education and skills to empower individuals that are equipped for success. The foundation facilitates world class experience and meaningful exposure

to its beneficiaries that will give them a competitive advantage in employability and success in managing businesses.

Through its Centre for Innovation and Learning, Sandock Austral runs some of the largest artisan training, graduate internship and in-service programmes in the industry.

LOCAL ANTIFOULING MARINE PAINT MANUFACTURER SETS SIGHTS ON EXPORT MARKET



PRODUCT MARKETS:
Domestic, industrial and marine



TECHNOLOGY STREAMS:
Antifouling paints for marine vessels

► **BENEFICIARY:**

Prostar Paints

► **PROJECT TITLE:**

ISO 17025: 2017 development and implementation/Antifouling system paint type approval

Prostar Paints was established in 2006 as a distributor of paint and accessories and has grown into a paint company with manufacturing operations in Durban, Cape Town, Johannesburg and the port of Richards Bay supplying the Southern and East African market. The company consistently searches out, develops and evaluates new materials, technologies and services that continue to improve their products and processes.



Prostar Paint manufactures a wide variety of paint products for the South African market.

According to Farzeen Khan, Quality Manager for Prostar Paint: “No South African company manufactures an approved marine antifouling system and no South African paint company is ISO 17025:2017 certified, which is why we approached the AISI for funding to assist with these key internal developments.”

Marine growth on the hull of ships is referred to as ‘fouling’ and it affects the performance of a vessel in a variety of ways. The maximum speed of a ship decreases as its hull becomes fouled with marine growth, and its displacement increases; it hampers a ship’s ability to sail upwind; some marine growth, such as shipworms bore into the hull causing severe damage over time; and the ship may transport harmful marine organisms to other areas.

Anti-fouling paint is a specialised category of coatings applied as the outer layer to the hull of a ship or boat, to slow the growth of and facilitate detachment of subaquatic organisms that attach to the hull and can affect a vessel’s performance and durability.

During the period under review, AISI funding facilitated the appointment of an International Association of Classification Societies (IACS) approved body to conduct IACS Product Approval Certification that Prostar Paints’ anti fouling product is compliant with the International Maritime Organisation (IMO) international convention on the control of harmful antifouling systems on ships (AFS 2001).

The process is a technical one, and includes, among a host of others, a review of product technical data and active ingredients, product testing and manufacturing approval.

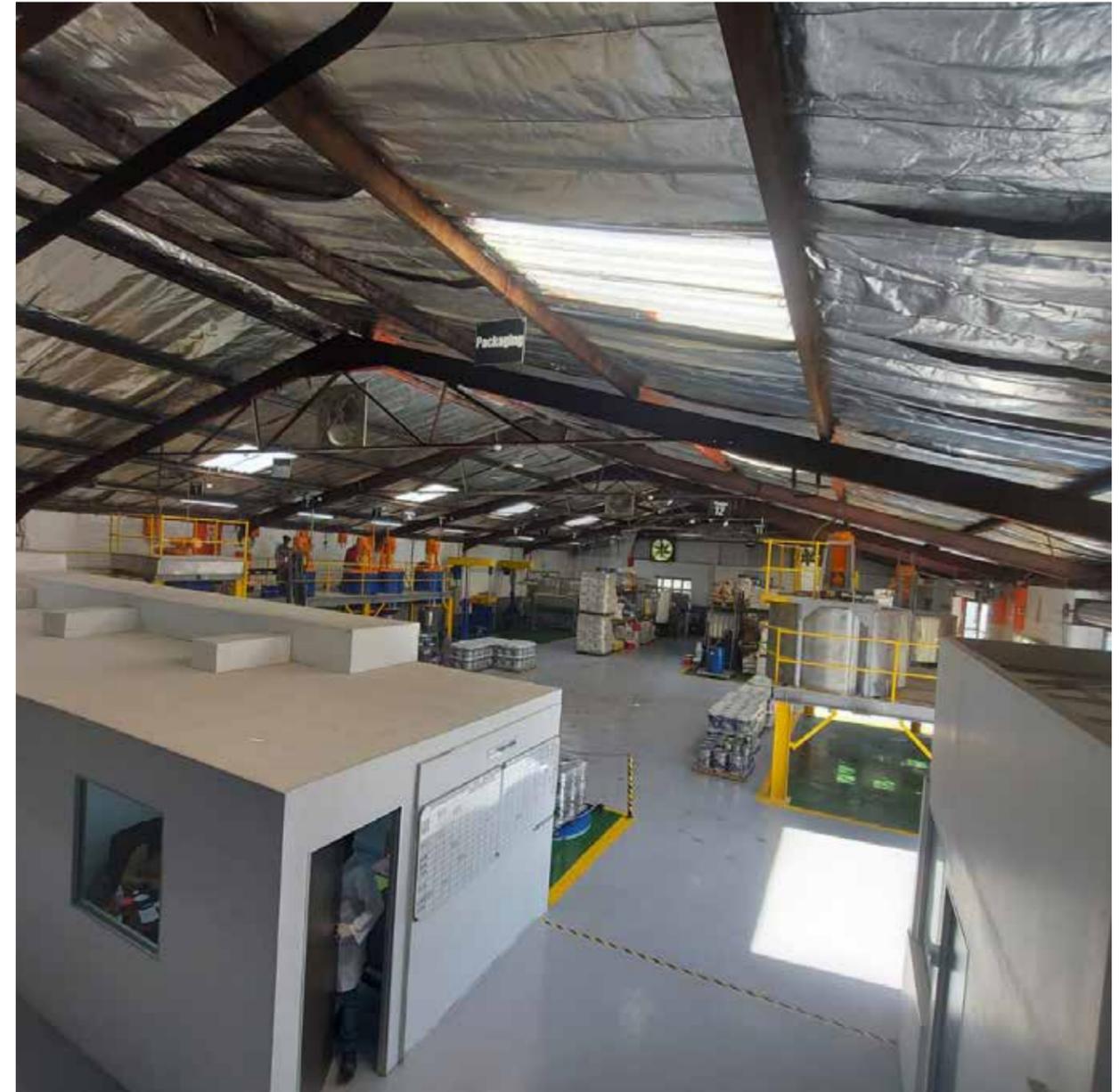
Bureau Veritas, an accredited and recognised supplier of testing, inspection and certification services, was appointed to undertake the certification of Prostar Paints’ anti fouling system.

After the finalisation and submission of the project workplan in July 2022, an audit of the Prostar Paint facility in Durban commenced. Bureau Veritas conducted a mode II audit of the Prostar Paint’s quality management system and facility. This process included a review of production methodology, quality control procedures, quality management system, raw material supply arrangements, testing procedures and regimes, and a review of the manufacturing facility itself.

“Certification of our anti-fouling system will not only result in our product being internationally certified therefore opening up export opportunities for our marine and protective coatings,” adds Khan “but, we will be the first South African approved marine manufacturing company to become a net exporter of paint products, which can stimulate the revival of the once thriving ship maintenance and dry docks business in the country.”



STANDARDS AND ACCREDITATION SUPPORT



ISO/IEC 17025:2017 specifies the general requirements for the competence, impartiality and consistent operation of laboratories and is applicable to all organisations performing laboratory activities, regardless of the number of personnel.

Anti-fouling paint is a specialised category of coatings applied as the outer layer to the hull of a ship or boat, to slow the growth of and facilitate detachment of subaquatic organisms that attach to the hull and can affect a vessel’s performance and durability.

NON-DESTRUCTIVE TRAINING AND CERTIFICATION CAPACITATES COMPANY AND ITS EMPLOYEES



PRODUCT MARKETS:
Engineering and construction



TECHNOLOGY STREAMS:
Fabrication, repairs and maintenance, artisan training and development

► **BENEFICIARY:**
Channel Marine and Trading

► **PROJECT TITLE:**
Non-destructive testing (NDT) training and certification (meeting the requirements of ISO 9712)

Channel Marine and Trading (Pty) Ltd is a Durban based company that specialises in multi-disciplinary engineering and construction projects and processes. It provides marine repairs and maintenance, artisan skills training and assessment, as well as fabrication and maintenance solutions to its customers.



Magnetic particle testing is performed on surface defects.

The AISI provided funding support for five employees to undergo non-destructive testing (NDT) training and certification to meet the requirements of ISO 9712.

NDT refers to the testing of material and components without inhibiting its further usefulness. Applied scientific principles such as electromagnetic induction, magnetism, capillary action, mechanical vibration, and electromagnetic waves are utilised to identify and characterise discontinuities within tested samples or areas of interest.

Crian Dickson, MD for Channel Marine and Trading, explains the importance of NDT training and certification: “The ISO 9712 accredited technicians are capacitated to verify the quality of our welds internally prior to a third party NDT company carrying out any official testing that, according to the relevant construction codes, must conduct final tests. This approach of carrying out our own NDT prior to the third party testing has reduced standing time of production staff as we are able to rectify any weld discontinuities that may be encountered during our internal test. We have noticed that the level of quality has increased, as there are more employees on the floor that understand the fundamentals and requirements of inspection and testing.”

“We employed the services of an outsourced Technical/QA/QC Manager who played an extremely important and valuable role in guiding young school leavers through a steep learning curve to PCN Bindt International certification level,” adds Dickson. “The learners were put through their paces on a few vessels and learned a great deal on the different fields of NDT.”

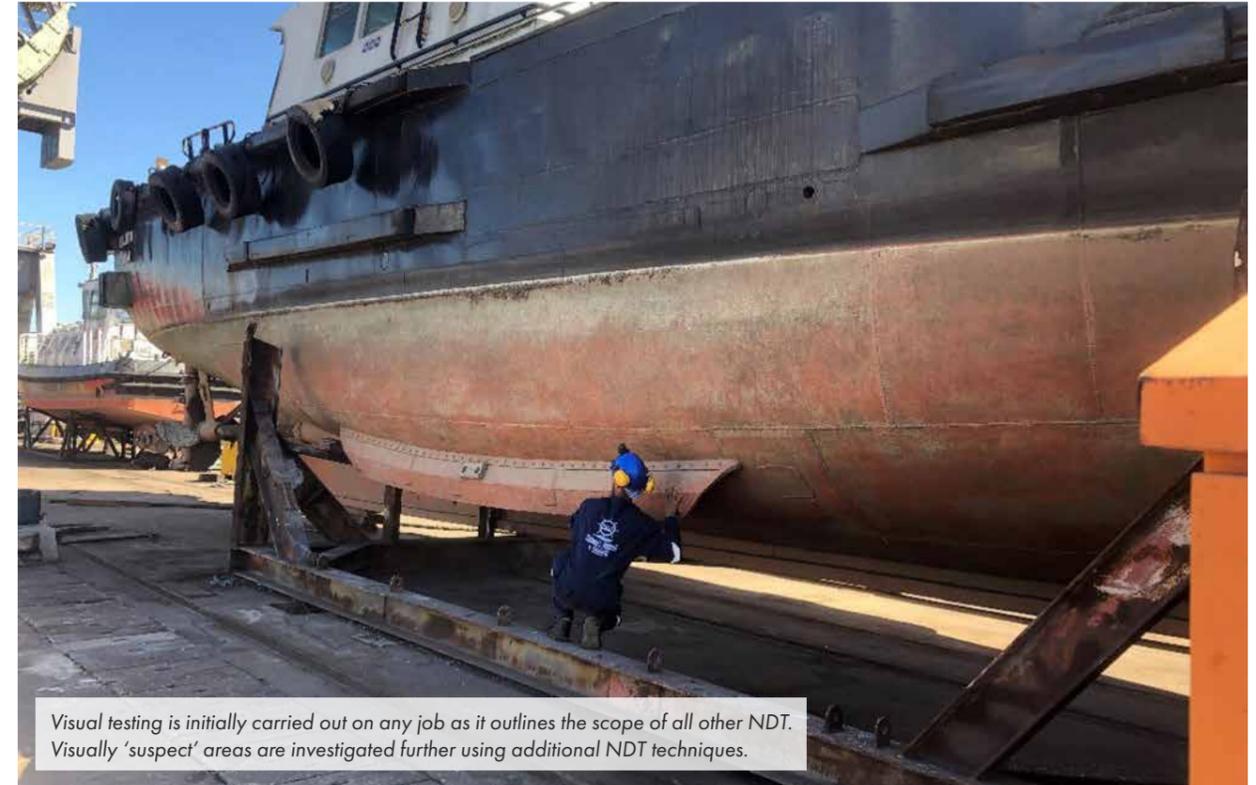
The British Institute of Non-Destructive Testing (BINDT) is an accredited certification body offering personnel certification against criteria set out in international and European standards through the internationally recognised PCN Certification Scheme.

Channel Marine and Trading’s short term goal is to grow the company and sustain its existence. In the long term, they aim to make an impact on the marine economy and establish themselves as a leading supplier of ship repairs and building, as well as general engineering and training needs in the marine space.

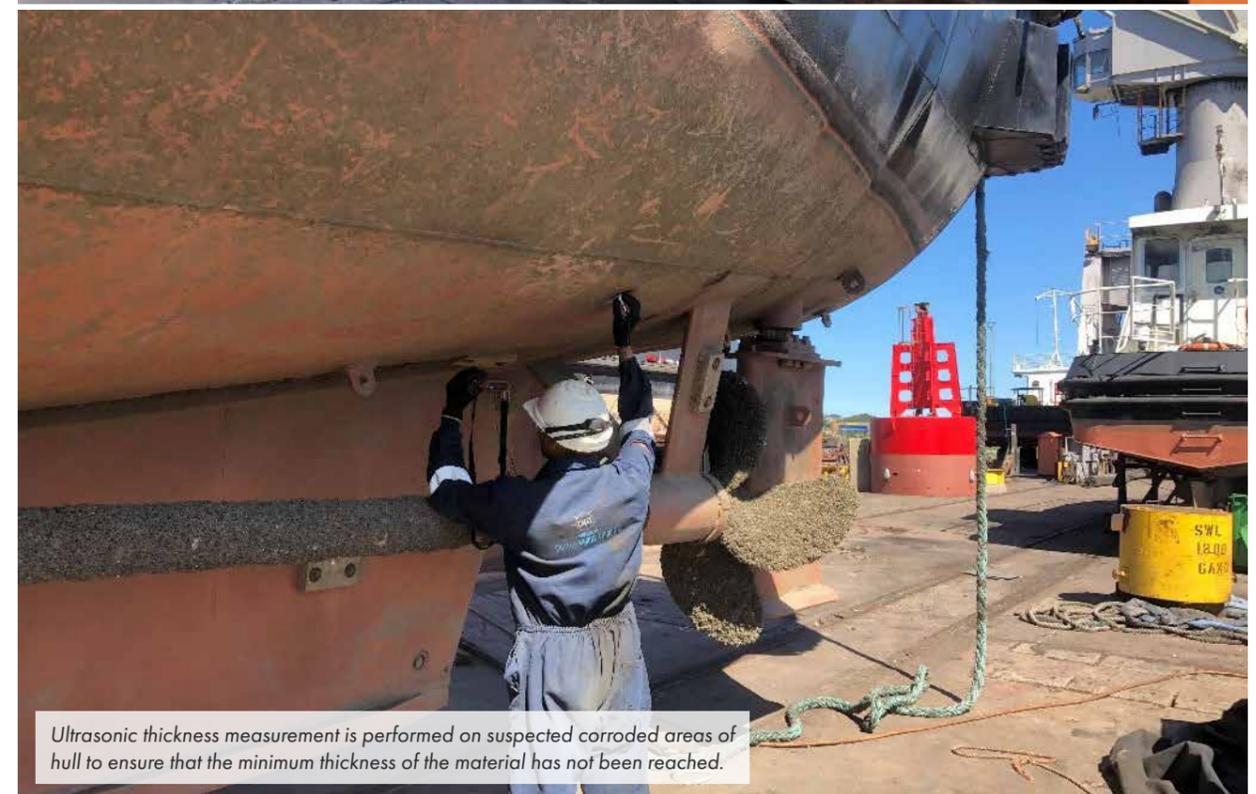
“With the funding support we have received from the AISI, we have not only been able to boost Channel Marine and Trading’s position in the marine environment, but we have also been able to capacitate young people with skills and knowledge that will serve them well in the future,” concludes Dickson.



STANDARDS AND ACCREDITATION SUPPORT



Visual testing is initially carried out on any job as it outlines the scope of all other NDT. Visually ‘suspect’ areas are investigated further using additional NDT techniques.



Ultrasonic thickness measurement is performed on suspected corroded areas of hull to ensure that the minimum thickness of the material has not been reached.

IMCA AND ISO 9001 ACCREDITATION PROVIDES INCREASED ACCESS TO MARINE INDUSTRY



PRODUCT MARKETS:
Marine



TECHNOLOGY STREAMS:
Commercial diving and marine support services

► **BENEFICIARY:**
Jokwa Marine

► **PROJECT TITLE:**
Design and development of policies, procedures, manuals, work instructions, forms and templates for accreditation purposes

Jokwa Marine was registered in 2014 as a Level 1 B-BBEE company with a short-term goal of becoming a leading supplier of commercial diving and marine support services to the marine industry in South Africa, the SADC region, as well as Economic Community of West African States (ECOWAS) countries. In the long-term, Jokwa Marine has set its sights on becoming a leading name in the oil and gas industries.



International Marine Contractors Association

The International Association of Classification Societies (IACS) is dedicated to safe ships and clean seas and makes a unique contribution to maritime safety and regulation through technical support, compliance verification and research and development. More than 90% of the world's cargo carrying tonnage is covered by the classification design, construction and through-life compliance rules and standards set by IACS.

The International Marine Contractors Association (IMCA) is a leading trade association that represents contractors and associated supply chains in the offshore marine construction industry worldwide. The IMCA plays an important role in collaborating with its members and other stakeholders to address the challenges of climate change and to ensure environmental sustainability within the context of the world's ocean resources.

It establishes minimum technical standards and requirements that address maritime safety and environmental protection and ensures their consistent application. This responsibility is carried out through its panels, expert groups and project teams and provides a Quality System Certification Scheme (QSCS) that its members are required to comply with, as an assurance of professional integrity and maintenance of high professional standards.

ISO 9001 is a standard that sets out the requirements for a quality management system. It helps businesses and organisations to be highly efficient and more customer focused. All activities offered by shipping companies and their related processes must be considered within the scope of a quality management system, which means that each activity will need to comply with ISO 9001 requirements.

To assist Jokwa Marine with the necessary IMCA and ISO 9001 compliance requirements, during the 2022/23 period, AISI provided funding for the design and development of policies, procedures, manuals, work instructions, forms and templates required for the necessary application processes.

"The marine environment is subject to numerous minimum standards on issues such as health, safety, quality, environmental and technical standards," emphasises Enrico Adams, CEO at Jokwa Marine, "but verbally claiming our proficiency is not sufficient, we are required to produce documented proof."

"The funding provided by AISI has not only enabled us to effectively produce the supporting documentation required for IMCA and ISO 9001 certification, but has assisted with our pursuit of business to service IACS accredited ships."

Jokwa Marine places extensive focus on its approach to the pursuit of operational excellence and their ongoing strategy is to deliver excellent ship management services, whilst strengthening their position as a leading provider of marine support services. In line with this, they have committed themselves to continuous improvement in every area.



STANDARDS AND ACCREDITATION SUPPORT

"Our dedication to environmental protection is more than a 'tick box' exercise in response to requirements for certification processes and we have adopted an environmental policy statement to reflect our commitment to ensuring our operations do not adversely affect the environment and that they comply with the requirements of the ISO 14001:2015 standard, as well as all relevant environmental legislation and statutory requirements"
Enrico Adams, CEO of Jokwa Marine



IDEALLY POSITIONED TO PROVIDE SHIP REPAIR SERVICES TO LOCAL AND INTERNATIONAL VESSELS



PRODUCT MARKETS:
Marine and automotive



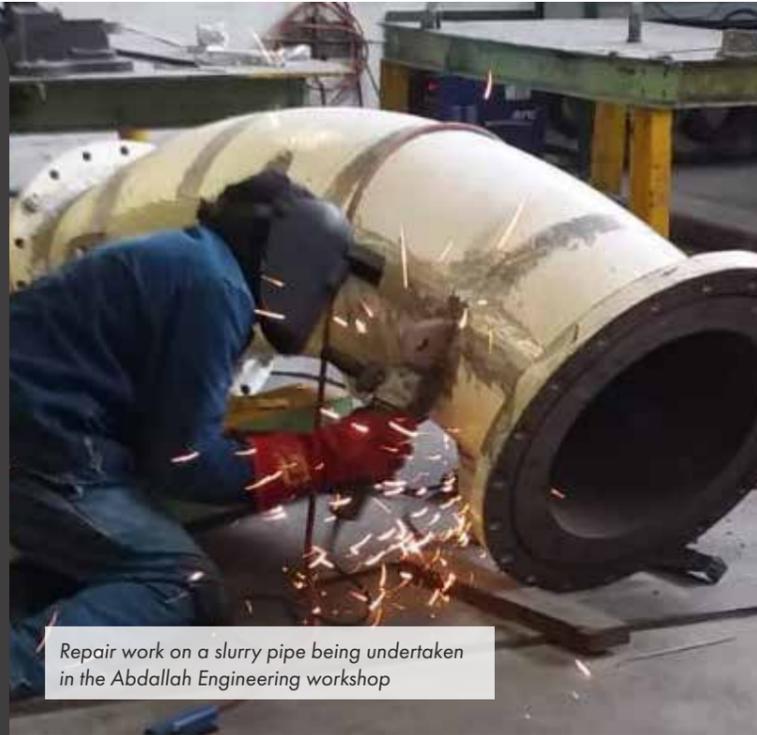
TECHNOLOGY STREAMS:
Various (focus on welding)

► **BENEFICIARY:**
Abdallah Auto & Engineering

► **PROJECT TITLE:**
International Association of Classification Societies (IACS) approved welding certification services

Abdallah Auto & Engineering comprises two operating divisions. Abdallah Auto is a tyre dealer and vehicle repair shop and Abdallah Engineering focuses on ship repair and fabrication workshop. Situated in Saldanha Bay north of Cape Town, the engineering division is ideally placed to provide ship repair services to South African vessels, as well international ones.

IACS International Association of Classification Societies



Repair work on a slurry pipe being undertaken in the Abdallah Engineering workshop

This is made possible through various certifications and accreditations. It is here that AISI funding was able to assist. During the 2022/23 financial period, Abdallah Engineering was successful in its pursuit of International Association of Classification Societies (IACS) approved welding certification services.

IACS is dedicated to safe ships and clean seas and makes a unique contribution to maritime safety and regulation through technical support, compliance verification, as well as, research and development. More than 90% of the world's cargo carrying tonnage is covered by the classification design, construction and through-life compliance rules and standards set by IACS.

The IACS certification allows Abdallah Engineering to provide ship repair services in line with IACS shipbuilding and repair quality standard no. 47 to the marine industry across the board including container and cargo vessels, passenger liners, offshore construction vessels, survey vessels, platform supply vessels, offshore service vessels, anchor handling tug vessels, rigs, floating production storage and offloading, as well as navy vessels.

In addition to IACS certification, Abdallah Engineering meets the requirements for ISO 15614 welding procedure specifications and the welding team are all in possession of a welding qualification that meets the Bureau Veritas Rules for the classification of steel ships (NR476).

In addition to being able to offer a wide range of services on vessels that are at anchor or in dry docks, Abdallah Engineering can also offer able seamen, ordinary seamen, oilers, deck crew and fire watchers.



STANDARDS AND ACCREDITATION SUPPORT



Members of the Abdallah team from left to right: M Wele, Ismail Abdallah, Tanja van Zyl, and Damien Theys

THERMAL SPRAYING ACCREDITATION TO OPEN ACCESS TO MARINE INDUSTRY



PRODUCT MARKETS:
Marine



TECHNOLOGY STREAMS:
Thermal spraying

► **BENEFICIARY:**
Surcotec (Pty) Ltd.

► **PROJECT TITLE:**
Thermal Metal Spray Procedure
Qualifications (according to IACS)

Surcotec is an engineering company situated in South Africa's Western Cape Province that provides customers with thermal spray coatings, specialised welding services and coatings for specific applications.

Since its establishment in 2000, the company has offered extensive maintenance and repair on industrial components that have been damaged by wear and corrosion, and that can be repaired through either thermal spraying or plasma transferred arc cladding.

Thermal sprayed coatings deliver some of the most cost-effective options to restore components and extend the life of components.

The funding supplied by AISI during the 2022/23 period enabled Surcotec to develop thermal metal spray procedure qualifications in line with the requirements as stipulated by the International Association of Classification Societies (IACS).

IACS is dedicated to safe ships and clean seas and makes a unique contribution to maritime safety and regulation through technical support, compliance verification and research and development. More than 90% of the world's cargo carrying tonnage is covered by the classification design, construction and through-life compliance rules and standards set by IACS.

"Our goal is to secure marine industry class approval and to become a verified Mode II workshop and once approved, we will have access to a much wider group of marine clients including international vessels," states Adriaan van Niekerk at Surcotec. "Increased business will increase the workload and therefore create more jobs and also allow Surcotec to obtain the latest thermal spraying technologies."

The potential impact of growth on employees will be realised with staff having access to training opportunities that were out of reach before the intervention. It will also allow for growth in the company that could lead to certain employees taking up more senior positions.



STANDARDS AND ACCREDITATION SUPPORT

WHAT IS THERMAL SPRAYING?

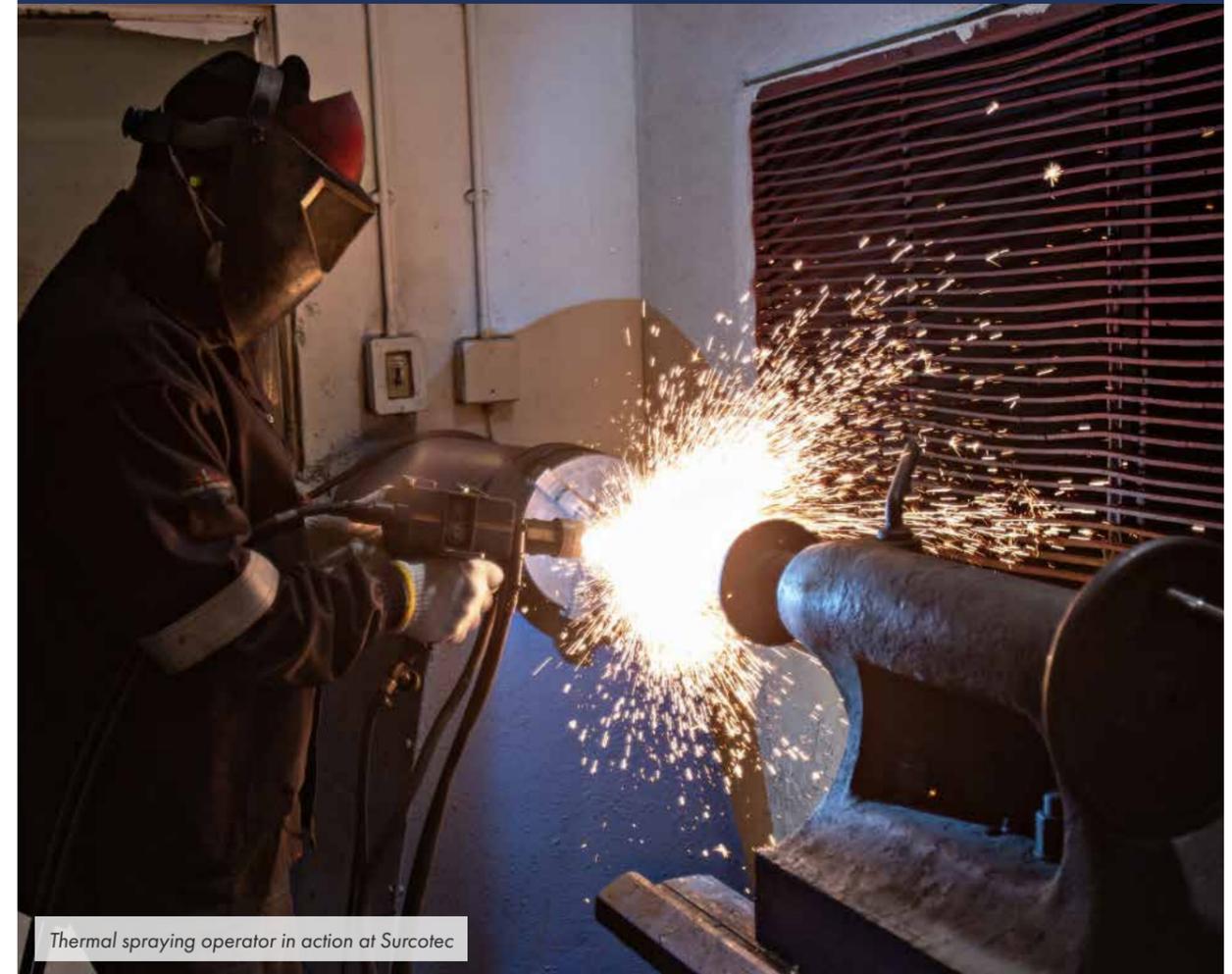
Thermal spraying refers to a process that applies a coating - most often a metal alloy, carbide or ceramic (that may vary in thickness) onto a substrate through the projection of a molten stream of the material.

Invented in the early 1900s, thermal spraying was a very simple process and generally used to perform very basic mechanical repairs. Over the last century, the technology has undergone rapid growth and development, and today, thermal spraying has become a very powerful tool, finding a wide range of applications in virtually every industry.

Thermal spray coatings are used to refurbish components subjected to degradation by wear, corrosion, oxidation or cavitation, all of which result in reduced service life. This process improves the performance and extends the service life of components.

BENEFITS OF THERMAL SPRAY COATINGS?

- Extended service life through the restoration of worn components to original dimensions
- Increased wear resistance against erosion, abrasion and sliding
- Increased resistance to cavitation
- Increased resistance to chemicals and corrosion
- Increased resistance to high temperatures and oxidation
- Increased traction



Thermal spraying operator in action at Surcotec

APPROVAL BY AMERICAN BUREAU OF SHIPPING PROVIDES ACCESS TO MARINE INDUSTRY



PRODUCT MARKETS:
Various industrial sectors



TECHNOLOGY STREAMS:
Composite rehabilitation and repairs

► **BENEFICIARY:**
Carbontech Composite Systems (Pty) Ltd

► **PROJECT TITLE:**
American Bureau of Shipping (ABS) type approval

Since 2017 Carbontech Composite Systems (Pty) Ltd has provided the manufacture, supply and installation of various composite rehabilitation systems for the industrial sector. A combination of chemistry, engineering and global expertise is brought together to drive progressive innovation in advanced composite technologies for the emergency repair of critical assets.

“There is nothing generic about us,” emphasises Manoli Coumbias from Carbontech, “We don’t just sell pipe wraps but rather accurate engineering backing to deliver tailored solutions.”

Having set their sights on becoming internationally recognised in the marine industry, Carbontech identified the need to secure approval from the American Bureau of Shipping (ABS). Funding provided by AISI for this purpose afforded them the opportunity to apply for ABS approvals that will allow Carbontech to perform any and all forms of offshore composite rehabilitations and repairs, which opens up a potentially brand new revenue stream for the organisation and an opportunity for growth and development into the global arena.

“ABS approvals will also create potential for increased employment opportunities for suitably qualified engineering personnel, as well as the training and development of these engineers with experience in composite engineering which is a limited resource in RSA,” adds Coumbias.

Carbontech’s core competencies include products compliant with ASME PCC2 and ISO TS 24817 and designs supplied in accordance with these specifications. This is backed up by an in-house design and engineering department with FEA capabilities, product development and testing facilities, engineering and technical support, as well as training programmes on composite repair systems.

Their core product, Revowrap, is an engineered composite solution used to restore damaged critical assets back to the original design specification of the equipment. Revowrap provides reinforcement of the piping in both the axial and hoop directions and delivers uniform loading throughout the repair. Their composite systems can be applied by hand lamination or by infusion methods and may be applied to live piping systems without shutting down for the repair. Revowrap may be applied to any pipe size, most substrates and almost any piping configuration including tanks, vessels, flanges, and other compromised structural assets.



Engineered composite wrapping solutions are used to restore damaged critical assets back to the original design specification of the equipment



STANDARDS AND ACCREDITATION SUPPORT



About ABS

The American Bureau of Shipping (ABS) is an American maritime classification society that seeks to promote the security of life, property, and the natural environment, primarily through the development and verification of standards for the design, construction and operational maintenance of marine and offshore assets. ABS's core business is providing global classification services to the marine, offshore, and gas industries. As of 2020, ABS was the second largest class society with a classed fleet of over 12 000 commercial vessels and offshore facilities. It develops its standards and technical specifications, known collectively as the ABS Rules & Guides that form the basis for assessing the design and construction of new vessels and the integrity of existing vessels and marine structures.

PROGRAMME 4: STANDARDS AND ACCREDITATION – SECTOR-WIDE

This programme assists the broader advanced manufacturing industries including marine to enhance their visibility within local and global supply chains and increase their competitiveness.

Table 5: Standards and accreditation – sector-wide

Beneficiary Name	Project Title
Cano Flowrate	ISO 9001 development, implementation and certification
5W Mask	5W Mask
Bullseye BEE Verification	SANAS accreditation
Aumanat	ISO 9001 development, implementation and certification

ISO 9001 CERTIFICATION ASSURES CUSTOMERS OF QUALITY MANAGEMENT



PRODUCT MARKETS:

Broad customer base requiring engineering services



TECHNOLOGY STREAMS:

Structural steel, plat works, mechanical services and piping

▶ BENEFICIARY:

Cano Flowrate (Pty) Ltd

▶ PROJECT TITLE:

ISO 9001 development, implementation and certification



Since its establishment in 2015 Cano Flowrate, has positioned itself as a well-established engineering and construction company that, supplies, fabricates and installs structural steel, plate works, mechanicals, and piping to multi-disciplinary engineering firms across a broad customer base. They are specialists in the maintenance and refurbishment of installations for existing and new clients.

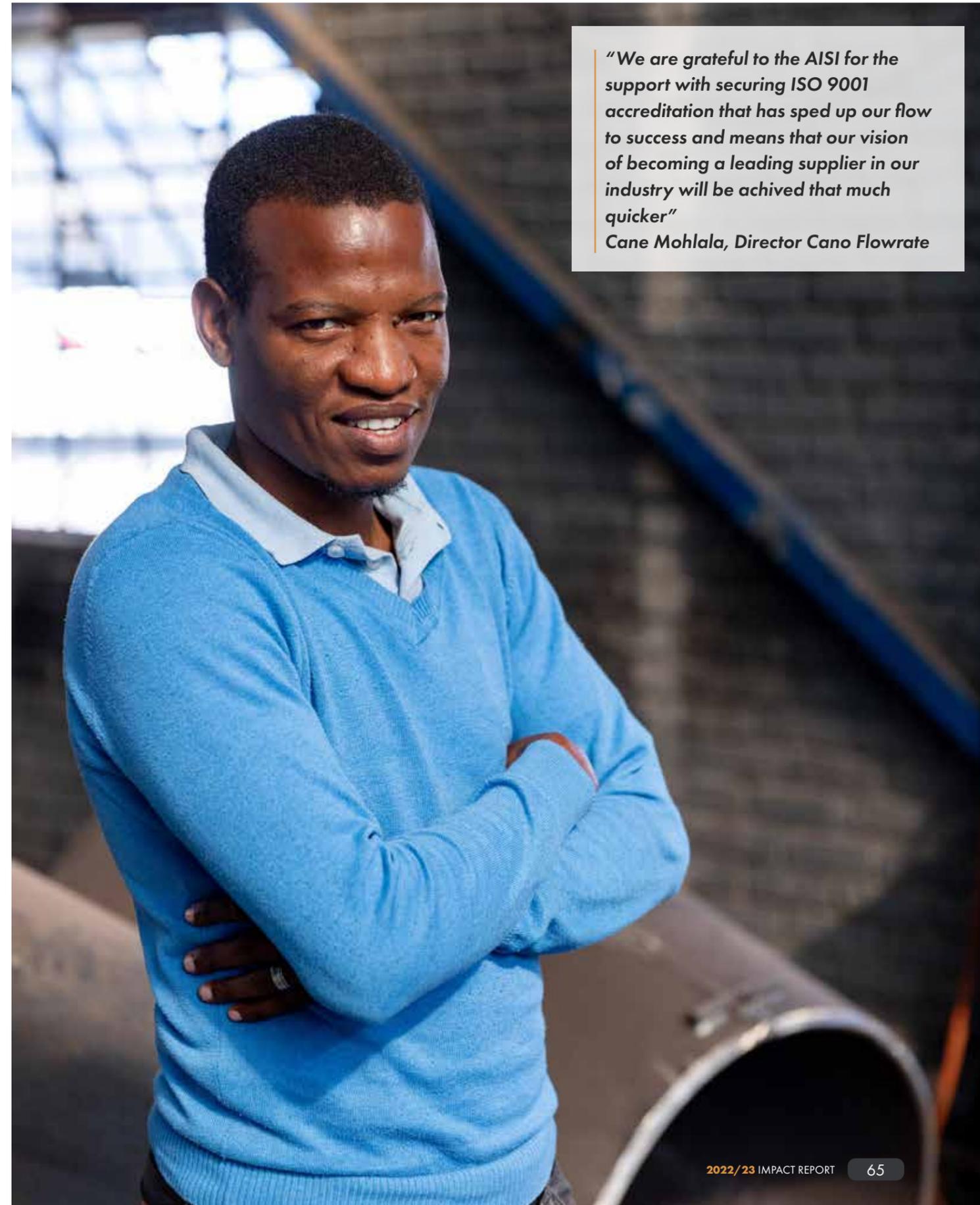
A continuing success factor would be the development, implementation and certification of ISO 9001, and it is here that AISI funding played an important role in during the 2021/22 financial period. The funding provided by AISI facilitated the successful achievement of all requirements for the ISO 9001 certifications that has enabled Cano Flowrate to provide assurance to their customers that all work undertaken is done so within an ISO compliant quality management system.

They pride themselves on their professionalism and diverse expertise, and the company recognises that its success lies in providing services that are driven by a combination of international and local skills, effective leadership, extensive experience, and above average communication and professional capabilities.

The services they offer extend beyond traditional construction projects and include industries like mines, process and metallurgical plants and collaboration with other engineering companies. Their existing client base includes serving municipalities, civil contractors, and the mining sector.



STANDARDS AND ACCREDITATION SUPPORT



“We are grateful to the AISI for the support with securing ISO 9001 accreditation that has sped up our flow to success and means that our vision of becoming a leading supplier in our industry will be achieved that much quicker”
Cane Mohlala, Director Cano Flowrate



SANAS ACCREDITATION BOOSTS ABILITY TO RENDER B-BBEE VERIFICATION SERVICES



PRODUCT MARKETS:
General



TECHNOLOGY STREAMS:
Verification services

BENEFICIARY:
Bullseye BEE

PROJECT TITLE:
SANAS Accreditation



Bullseye BEE was established in 2021 with the aim of making a positive impact on the community. Their primary focus is to provide B-BBEE (Broad-Based Black Economic Empowerment) services to clients that are perceived as being both factually and perceptually independent from their measured entities, related parties, and themselves.

The company's entrenched long-term goals focus on two main objectives: creating a strong brand reputation for delivering high-quality service and becoming the recognized leader in the B-BBEE space. These goals reflect the company's commitment to excellence and its ambition to stand out in its industry.

A continuing success factor would be accreditation from the South African National Accreditation System (SANAS.) This accreditation is a significant achievement for a business operating in the field of BBEE. It demonstrates that the company meets the required standards and can provide reliable services in assessing and verifying BBEE compliance. SANAS accreditation enhances the company's credibility and reputation, making it a trusted partner for businesses seeking BBEE verification services.

It is here that AISI funding played an important role in during the 2021/22 financial period. The funding provided by AISI facilitated the successful accreditation from SANAS that allows Bullseye BEE to actively seek business as a SANAS-accredited agency.

The funding has also contributed to the creation of employment opportunities. By employing four individuals, the company has not only provided livelihoods for these individuals but has also expanded its internal capacity. The additional workforce can support the company's operations, handle increased demand, and take on more projects or clients. Job creation is a positive outcome that benefits both the individuals employed and the overall economic development.



The team behind Bullseye BEE Verification. Front from left to right: Shaylin Mathieson, Verification Analyst; Ali Tshabalala, Director and Technical Signatory; and Lesego Mautloa, Verification Analyst. Back: Noma Koranteng, Director and Technical Signatory.

COMPLIANCE WITH REGULATORY REQUIREMENTS UNDERPINNED BY ISO 9001 CERTIFICATION ASSURES CUSTOMERS OF QUALITY MANAGEMENT



PRODUCT MARKETS:
Power generation, transmission and distribution, water and waste, mining, paper and pulp, sugar, food, petrochemical, shipping, steel



TECHNOLOGY STREAMS:
Valve automation

BENEFICIARY:
Aumanat

PROJECT TITLE:
ISO 9001 development, implementation and certification



Having identified the need for the supply of valve automation to the South African market prompted Peter Meyer to establish Aumanat in 1995. Subsequently, German Company Auma Riester GmbH & Co approached Peter Meyer to represent Auma actuators in Kwa-Zulu Natal Region. Aumanat has since evolved into offering all styles of actuators including electric, pneumatic, electro-hydraulic simply and portable to meet industry demands for a complete valve automation solution.

Not only do they supply to a wide range of local customers, their reach extends to other parts of and includes Namibia, Zambia, Tanzania, Mauritius, Swaziland and as far afield as Saudi Arabia and South America. They collaborate closely with customers during the design stage in the selection of the correct combination of actuator to ensure efficient and reliable operation based on the customers' requirements.

Having identified the importance of ISO 9001 certification resulted in an application to AISI for assistance with the necessary ISO 9001 development, implementation and certification purposes. By achieving the certification, customers would be assured of the organisation's standards and their ability to consistently provide products and services that meet customer and regulatory requirements.

BLACK-OWNED SMME SECURES ISO 13485 QUALITY MANAGEMENT SYSTEM CERTIFICATION FOR MEDICAL DEVICES



PRODUCT MARKETS:
Range of product markets



TECHNOLOGY STREAMS:
Non-woven medical products

BENEFICIARY:
5W mask

PROJECT TITLE:
5W mask



5W Mask is a manufacturer of non-woven medical products in South Africa and their mission is to deliver high quality surgical face masks, medical scrubs, isolation gowns and footwear covers at competitive prices in South Africa. This 100% black-owned business comprising 20% black youth, 20% disabled and 15% black employee trust owned operates as an ethical and sustainable supply solution in the medical devices industry.

The company received funding support from the AISI for ISO 13485 certification. ISO 13485 is a two-stage registration audit that is performed by an external third party.

Table 6: Technology enhancement – sector-side

Beneficiary Name	Project Title
Aumanat/CSIR	Pneumatic Actuator Test Bench
Khentsa Group	Oxygen and thermal lacing tube – aftermarket hydrostatic pressure tester
Prosthetic Engineering Technologies (PET)	Manufacturing support for a prosthetic liner
WILEC (Makarange Electrical Industries)	WILEC continuously transposed conductors (CTC): accreditation programme project
Premier Mats	Premier Mats growth project
Circumfort/CSIR	Medical device regulatory support to Stoelbag Foundation (Soweto) regarding the Circumfort circumcision dressing

CSIR EXPERTISE CONTRIBUTES TO DEVELOPMENT OF PNEUMATIC ACTUATOR TEST BENCH



PRODUCT MARKETS:
Variety of industrial applications



TECHNOLOGY STREAMS:
Mechatronics

► **BENEFICIARY:**
Aumanat/CSIR

► **PROJECT TITLE:**
Pneumatic Actuator Test Bench



Aumanat is a South African company with 27 years of experience in the supply of electric, pneumatic and portable actuators, as well as valve gearboxes that are suited to a wide variety of industrial applications. An actuator is a machine component that is responsible for moving and controlling a mechanism or system.

To qualify actuators against accepted industry standards, Aumanat needed a test bench able to operate pneumatic actuators under simulated field conditions over an extended testing period. With funding provided by the AISI, Aumanat was able to collaborate with the CSIR in achieving the goal of producing pneumatic actuators that are verified to operate according to industry specifications.

Pneumatic actuators are a mechanical design, where casting processes and selection of the correct materials play a large role. For this, Aumanat is tasked with the design and construction of various sizes actuators, where each size has its own application area in that a larger or smaller range of torque is available per model. The developed actuators are then tested on a test bench to ensure proper long-term functionality.

An actuator test bench is a complex mechatronic system, consisting of electronic, mechanical, pneumatic, hydraulic, control and software systems.

This project is a collaboration between the Centre for Robotics and Future Production (CRFP), part of the Manufacturing Cluster in the CSIR, and Aumanat in mainly a consulting role having supplied the specifications and some of the technical inputs. The activities outlined for this project at the outset included actuator design, development and limited production; system engineering that captured user needs and specifications; mechanical design and manufacturing; electronic and electrical design and manufacturing; software development and testing; system trouble shooting, testing, and verification; and installation and commissioning at Aumanat.

“Steady progress has been made with the project but it has encountered supply constraints,” comments from Aumanat. “The supply constraints are unfortunately a world-wide phenomena that everyone is battling with and we have seen instances of component lead times of over a



NEW PROCESS DEVELOPMENT



EXPORT CAPABILITY ACHIEVED



5 SMMEs INVOLVED



year. The solution to this problem is to iterate the designs until supplies can be found, this holds true for pneumatic, electronic as well as mechanical products.”

The design calls for extremely sturdy construction as the forces of the test procedure can be high, and the construction needs to be able to cope with these demands for extended periods. By the end of the reporting period, the mechanical design process was close to complete with some minor changes required.

Aumanat has made good progress with the design and production of the various sized actuators and challenges such as material choices

have been largely addressed. The biggest remaining issue is the quality of the casting, specifically sub-par porosity, and in this regards CSIR is playing an advisory role at the third-party casting facility.

“We are extremely grateful to the AISI and CSIR for their involvement in this project that on completion will result in numerous benefits to Aumanat, the industry and ultimately the country,” concludes Meyer.

PRESSURE TESTER FOR THERMAL LANCING TUBES TO CONTRIBUTE TO SAFETY MEASURES



PRODUCT MARKETS:

Manufacturing, engineering, fabrication and mining



TECHNOLOGY STREAMS:

Improved safety through pressure testing of lancing tubes

BENEFICIARY:

Khentsa Group

PROJECT TITLE:

Oxygen and thermal lancing tube – aftermarket hydrostatic pressure tester

Khentsa Group was established in 2013 and is a supplier of thermal and oxygen lancing tubes to a wide range of industries including, manufacturing, engineering, fabrication, mining and various state-owned entities (SOEs). Lancing tubes are utilised in the continuous production processes for copper, demolitions, ferroalloys, platinum, scrap cutting and steel making.



Mpho Magoma is seen here preparing the thermal lancing tube for testing

Lancing tubes are used predominantly during the tapping process in foundries and smelting plants, as well as for open holes in blast furnaces, induction furnaces and oxygen furnaces.

The project for which Khentsa Steel received funding from the AISI sought to improve and increase safety standards as part of the quality management process, thereby mitigating and minimising the risk of product failure in a smelter or furnace that could result in fatalities. To achieve this, Khentsa Steel required a pressure tester to accelerate the testing of thermal and oxygen lancing tubes or other components to evaluate the integrity of the tube. Pressure testing can evaluate the structural integrity of the tubes and eradicate human error.

“We strive to be a supplier with the ability to meet customer needs according to the highest requirements in quality standards and specifications and have identified a need for an additional safety mechanism within our production processes,” comments Ronnie Jacobs, Chief Business Officer for Khentsa Steel. “Our products are fluid-carrying commodities that are utilised within highly flammable spaces, and we cannot afford to have products that leak on their weld seam.”

Khentsa, in collaboration with Têgo Products, developed an aftermarket pressure tester and within a year was ready to build a prototype that was a first in the industry. They were certain that the technology developed would not only address critical safety issues in the production of lancing tubes, but would also boost Khentsa’s internal quality processes.

The pressure test acceptance criteria are generally determined by two kinds of outputs, namely the duration and the pressure that the tubes can withstand. The pressure tester designed by Khentsa Steel is able to test the pipe up to 40bar pressures and has the capability to hold the lancing tube for a predetermined duration that will check for leaks along the welded seam of the lancing tube being tested.

In the event that the pipes have defects in the seam weld or leaks anywhere else in the pipe, the pressure gauges will not move or the pressure levels will drop. A leak will show a constant dropping level in the gauges, which could signal a drop in the recommended pressure levels. The testing criteria has been set at a hold of eight seconds and should a tube not be able to hold the pressure that long, and that would signal a defect with the product.

The pipe tester was designed to accommodate four different lancing tube diameters. When commissioning the machine, they found that the sample rubber gasket collapsed at 15 bar pressures. They then tried various materials to get a proper seal that would be able to withstand higher pressures and finally managed to source gaskets made from a much harder rubber that resulted in achievement of the required pressure.

The primary purpose for the development of the pressure testing equipment was to offer an element of safety into lancing tubes by eliminating potential human error in the quality process and the AISI funding has provided Khentsa with a competitive advantage to present to customers.



NEW PROCESS DEVELOPMENT



TECHNOLOGY DEVELOPMENT



2 SMMEs INVOLVED



Seen here from Khentsa Steel from left to right are: Vinodh Patel, Ronnie Jacobs and Akshaye Patel

LOCALLY PRODUCED PROSTHETIC LINERS TO MAKE QUALITY PRODUCTS MORE ACCESSIBLE TO SOUTH AFRICAN LOWER LIMB AMPUTEES



PRODUCT MARKETS:
Suppliers of orthotic devices



TECHNOLOGY STREAMS:
Polymer castings

► **BENEFICIARY:**
Prosthetic Engineering Technologies (PET)

► **PROJECT TITLE:**
Manufacturing support for a prosthetic liner

Prosthetic Engineering Technologies (PET) is a Gqeberha based start-up SMME that aims to locally manufacture silicone polymer liners for use with prosthetic limbs. Such liners are currently all imported and their cost limits their widespread use in the public sector.

Both private and public sector market segments exist.



WHAT IS A PROSTHETIC LINER?

A prosthetic liner serves as the interface between the amputee's residual limb and the prosthetic socket. The functions of a prosthetic liner are to:

1. Prevent skin abrasions.
2. Reduce bone pressure inside the prosthetic socket.
3. Improve socket suspension.
4. Absorb shear forces (shock) during walking.
5. Improve skin health by improving hygiene.

An opportunity was identified to localise manufacture in South Africa with a view to sell locally and via export, particularly into Africa. Prior to the start of the proposed work, PET had managed to produce single liners in lab trials, but had not formalised the configuration management or manufacturing data pack and require support to do this so that a bedded-down manufacturing process is specified.

“Challenges faced by amputees in SA are high import costs, weak ZAR exchange rate and very limited government budgets for the purchase of orthotic / prosthetic components,” comments Luvuyo Sume from PET, an experienced industrial engineer and himself a lower leg amputee.

“These challenges impact the amputees directly as they are often supplied with outdated prosthetic technology, for example fabric socks instead of polymer liners, that limit their physical comfort and level of mobility. This significantly impacts quality of life for them and their immediate caregivers and can limit their ability to secure employment,” he adds.

The CSIR's Industrial Sensors Impact Area has extensive product development experience related to configuration management, manufacturing of data pack creation, polymer casting and quality management systems. Because of this, the CSIR is able to engage in medical device related product development work.

The goal was to support PET in its development of a local manufacturing process and to ensure that this is done in accordance with the ISO standard so that the output documentation is aligned with the requirements of medical device registration and a SAHPRA medical device establishment license application, all of which is made possible through the ISO 13485 system and experience. The CSIR hosted PET in its polymer casting facility and supported PET in the development and delivery of a repeatable and reliable manufacturing process with the associated documentation.

Key support provided for this project included trial liner castings, training on the principles of configuration management and quality management systems; guidance on establishing a product breakdown structure with associated documentation; support in determining required documents for the liner product and guidance on completion of such documents; ongoing support/documentation reviews to ensure completion of the MDP; and a visit by the CSIR to Gqeberha where the first liner manufacturing trial took place at PET.



NEW PROCESS DEVELOPMENT



EXPORT CAPABILITY ACHIEVED



5 SMMEs INVOLVED



Luvuyo Sume (left) has first-hand experience of obtaining prosthetic liners from the public sector and the expense of them from the private sector. His personal experience gives him strong insights into end-user requirements, and he has personally tested the initial lab samples himself. Riaan Knight (right) has been in practise as a clinical orthotist and prosthetist for 37 years and has a detailed understanding of the biomechanics of the human body with an understanding of prosthetic fabrication, alignment and patient rehabilitation. He has been trained in the design and manufacture of prosthetics.



Mhlupeki Mavuso on the left is a technologist at the CSIR and he is seen here with Luvuyo Sume in the CSIR polymer casting facility.

ACCREDITATION FROM LOCAL TRANSFORMER MANUFACTURERS TO BOOST AFRICA'S FIRST CTC PRODUCTION LINE

PRODUCT MARKETS:
Large power transformers

TECHNOLOGY STREAMS:
Continuously transposed conductors

BENEFICIARY:
WILEC (Makarange Electrical Industries)

PROJECT TITLE:
WILEC continuously transposed conductors (CTC): accreditation programme project

Wilec manufactures and supplies conductors and other associated components to the electrical manufacturing and repair industries locally and for export, mainly into East Africa, Indian ocean islands and Australia. The company employs 352 employees with manufacturing sites in Olifantsfontein and City Deep.

CTCs are used for windings on power transformers and consist of enameled rectangular wires that are transposed to create a type of rectangular strand. In the CTC, each elementary conductor consecutively and repeatedly assumes every possible position inside the cable. The bundle of strips can be wrapped and insulated with tapes, generally in pure cellulose paper.

The transposition of the elementary conductors allows the creation of a very flexible product, able to adapt perfectly to the winding, with a significant reduction in electrical losses for the same section, compared to a solid conductor. By acting on the number of units (strips) composing a CTC, various advantages can be obtained for use in the transformer.

CTCs are widely used on large power transformers and are key to local industry competitiveness and to meet local content initiatives and targets.

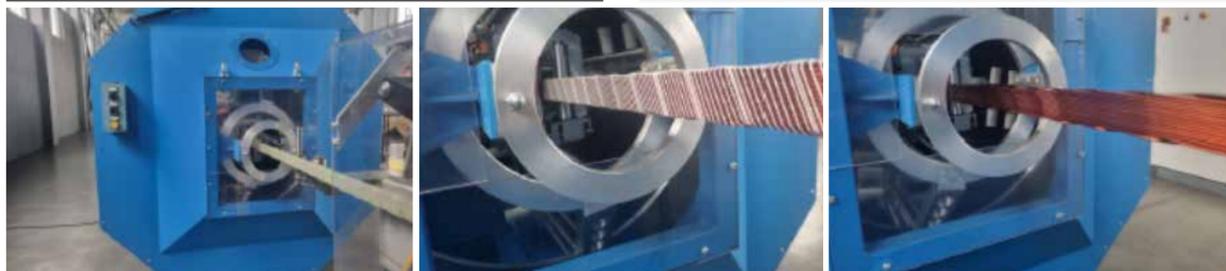
Wilec sought to secure accreditation from leading local transformer manufacturers, such as Actom Power Transformers, SGB Smit and WEG Transformers. It is here that funding provided by the AISI assisted Wilec to secure the requisite accreditations to enable the company to receive, manufacture, and supply its first orders. As market exposure and adoption is entrenched, the demand for Wilec's CTC capabilities is expected to flourish.

Wilec manufactures the enamelled strip and converts this into finished CTC to meet the OEM requirements. The CTC is tested and validated to ensure that the customers' specified requirements are met.

"We are extremely proud of the CTC capability that it has installed as it is the first of its kind for South Africa and Africa," comments Howard Eldridge, Engineering Executive for Wilec. "The ability to produce CTC in South Africa is of strategic importance to the country, ESKOM, and stakeholders in the transformer manufacturing industry as it supports government initiatives for growth, employment, and local industry."

"We have plans to expand our capabilities even further in terms of CTC production and supply in future," adds Eldridge "and we would like to express our sincere thanks and appreciation for the support that this project has received by the funding provided by the AISI."

In January 2022, Wilec installed and commissioned Africa's first Continuously Transposed Conductors (CTC) production line.



These images were taken of one of Wilec's first orders. For this particular order, netting tape was applied to the conductor bundle, which is usually at the request of the customer. The purpose of the netting tape is to improve oil flow and cooling in the final product (a transformer). The improved oil flow assists with improving the electrical performance of the transformer at the end user.

NEW PROCESS DEVELOPMENT

EXPORT CAPABILITY ACHIEVED

5 SMMES INVOLVED

POST CIRCUMCISION HEALTH INNOVATION BENEFITS FROM MEDICAL DEVICE REGULATORY SUPPORT

PRODUCT MARKETS:
Circumcised men and young boys

TECHNOLOGY STREAMS:
Healthcare

BENEFICIARY:
Circumfort (Stoelbag Foundation)

PROJECT TITLE:
Medical device regulatory support to Stoelbag Foundation – Circumfort circumcision dressing

When South African entrepreneur Musa Morgan learnt that sticky tape is used by millions of young men to heal from bush circumcision rituals and that infection related to the environment and post procedure treatment often leads to medical complications, he had an idea.

Working collaboratively, Musa Morgan, and his two business partners, Lwazi Ntshangase and Nokubonga Dlamini, as well as The Innovation Hub and Rocketfuel set about designing a solution to the problem. The result was the Circumfort kit that helps boys heal after bush circumcision.

The product designers integrated smart hygiene control materials using simple but effective design cuts, to make this innovation affordable, simple to manufacture, and faster to scale. An adjustable velcro secured padded strap provides comfort while holding the affected area in a comfortable position discreetly for day-to-day use during the healing process.

During the 2022/23 financial period, funding from AISI provided the Stoelbag Foundation with medical device regulatory support for the Circumfort circumcision dressing. This support also provides the company with access to technical documents that will allow it to expand operations by outsourcing manufacturing to secondary

manufacturers thus increasing the impact and market, as well as the opportunity to generate additional income through royalties.

"Whilst the main benefit derived from the development of the Circumfort has been an effective means to address the risk of post circumcision infection, other benefits have been realised in that the invention provides localised employment of community members, skills development in textiles and operation of machinery, and intellectual property originating in South Africa," comments Musa Morgan.

"The Stoelbag Foundation is situated in Soweto and currently employs nine people. It has not only improved the lives of the people it employs, but is making a valuable contribution to the township economy in which it was founded," concludes Morgan.



A highlight for the team from the Stoelbag Foundation was winning the coveted Township Entrepreneurship Award in 2018 for their innovative idea. The award is an initiative by the Gauteng Department of Economic Development to celebrate, recognise and reward entrepreneurial talent in the townships, whilst supporting the provinces' goal to commit to and revitalise township economies.

DIGITISATION OF MANUFACTURING PROCESSES ELEVATES PREMIER MATS ABILITY TO SERVICE MARKET



PRODUCT MARKETS:
Automotive



TECHNOLOGY STREAMS:
Custom production of rubber car mats

BENEFICIARY:
Premier Mats & Accessories (Pty) Ltd.

PROJECT TITLE:
Premier Mats Growth

This woman owned SMME was established in 2013 as an entrepreneurial enterprise by director and founder Madelein Marais. Premier Mats & Accessories has grown rapidly to become the preferred supplier of custom floor mats in the commercial vehicle market of South Africa. Having spent 12 years in sales in the automotive industry, Marais recognised the need for a functional, affordable, safe, hard-working, and value adding product.



Maria Madisha is seen here sewing a mat for a UD Quester.

Since its establishment, Premier Mats & Accessories has become the approved supplier to OEMs UD SA Trucks, Hyundai SA Commercial, major motor group dealers, MAN SA (Product OEM approved) CFAO Motors (Unitrans), Imperial / Motus, Barloworld, Sandown, Supergroup, McCarthy's/Bidvest, and others. Other clients include prestige clientele, such as, Porsche SA and various established fleet owners.

"By constantly and consistently adjusting, improving and expanding our product range, we work towards the goal of ultimate perfection," comments Marais "and part of this was the need to replace largely manual production processes with more effective digital processes to further enhance the quality of the products we produce."

The result was a chain of events starting with the Automotive Industry Development centre (AIDC) that contacted the Council for Scientific and Industrial Research (CSIR). The CSIR, in turn, assisted Premier Mats & Accessories to apply for funding from AISI that would result in the development and implementation of some key digitisation processes to improve manufacturing efficiency.

Thishen Naicker from the CSIR provided an overview of the support provided to Premier Mats & Accessories.

The process employed by Premier Mats & Accessories prior to the assistance from CSIR involved the creation of physical templates for a specific make and model of vehicle. In doing this, IP was being created. However, the IP was sitting on the shelves in the factory, which presented a massive risk. By digitising the template process, it addressed the risk of losing the physical templates.

Additionally, by digitising the templates, Premier Mats & Accessories would be able to make use of a CNC machine that requires templates.

The team from the CSIR also assisted with the development of a manufacturing execution system to track manufacturing processes. This system replaced a paper-based one and a key benefit of this system is the ability to identify any defects and where the defect originated from in the process to allow for the problem to be addressed.

Finally, using a camera-based system, capacity to conduct visual quality assurance checks further added to Premier Mats & Accessories goal to produce an excellent quality product each time.

Premier Mats & Accessories currently employs seven people, but the introduction of the digitisation processes means that they have capacity to grow the business and hopefully employ more staff.

"We are extremely grateful for the support provided by CSIR and AISI as it allows us as an SMME to operate at a level on par with larger competitors and the huge improvements in production operations will yield numerous positive results," concludes Marais.



STANDARDS AND
ACCREDITATION SUPPORT



MAINTAINED 7 JOBS

A CNC machine is a computerised manufacturing process in which pre-programmed software and code controls the movement of production equipment. CNC machining controls a range of complex machinery, such as grinders, lathes, and turning mills, all of which are used to cut, shape, and create different parts and prototypes.



The dynamic team from Premier Mats & Accessories seen here from left to right are: Lizelle Henning, Johannah Msiza, Maria Madisha, Violet Mamonyane, Madelein Marais and Lerato Mokano.

PROGRAMME 5: COORDINATION, PROMOTION AND AWARENESS

This AISI programme plays a critical role in coordinating information on the aerospace and marine sectors in South Africa. The programme enables the AISI to promote industry capability to relevant stakeholders and interested parties through its networks. The AISI's offerings are jointly promoted through the AISI's channels to ensure that **the dtic's** support within the South African aerospace and defence sector, as well as a variety of sector-wide industries including the marine industry are well represented at appropriate forums. Through this programme, the AISI also seeks to provide potential beneficiaries with information on the application processes to be followed in order to receive AISI support.

A&D INDUSTRY DAY WEBINAR

The AISI hosted an Aerospace and Defence Virtual Industry Day on 23 March 2023. More than 60 attendees were recorded for the session. The programme featured presentations from two AISI beneficiaries namely LambdaG and Etion Create. The AISI also had an opportunity to engage with the aerospace and defence industry regarding some of their challenges such as loadshedding and ideas were shared on how the AISI can assist with some of them. During the same session, the AISI also presented on the 2023/24 application process for companies interested in AISI support. The engagement also helped inform the business planning process for the 2022/2023 financial year.

SECTOR WIDE ACCREDITATION WEBINAR

The AISI hosted a Sector Wide Accreditation webinar focused on the Automotive Industry in South Africa on 31 March 2023. The webinar featured a presentation from the AISI Technical Leader on AISI support and engagement on current challenges and opportunities for support. About 19 people from the Automotive Industry participated in the session. The session was organised with assistance from the Automotive Industry Development Corporation (AIDC). Follow up engagements are already expected in the next quarter based on the engagements made after the presentation.

CJED WEBINAR SERIES PRESENTATION

The AISI gave a comprehensive presentation to the 3-day Calestous Juma Executive Dialogue (CJED) webinar series as coordinated by African Union Development Agency (AUDA-NEPAD). The initiative had a talk during the "3D Printing: Unlocking Endless Possibilities for Africa" webinar that was hosted on Friday, 3 February 2023. The event had participants from various countries within the continent and

there was appreciation of how South Africa continues to accelerate advanced manufacturing technologies and technology management.

AERONAUTICAL SOCIETY OF SOUTH AFRICA (AESSA) CONFERENCE.

The AISI contributed towards the successful hosting of the Aeronautical Society of South Africa (AeSSA) conference that was held at the CSIR International Convention Centre, Pretoria, South Africa on 7 November 2022. The theme of the conference was "A Celebration of SA Successes". One of the main presenters for the Conference was Philip Venter from Petrawell, an AISI beneficiary. The presentation centred around an AISI project on the design and manufacture of high pressure and cryogenic composite filament winding vessels. The conference was well attended and informative presentations from different sectors of aerospace and defence were made.

MARINE INDUSTRY WEBINAR

The AISI hosted a Marine Webinar on 30 May 2022. A total of 87 attendees participated in the event which was a great turnout. The webinar featured several speakers including representative from **the dtic** Andrew Mukandila, Dr Nicolene Roux from the CSIR/AISI, Mar Glock from Bereau Veritas and Dr Howard Theunissen from the Department of Marine Engineering at the Nelson Mandela University.

MEDIA ARTICLES

An article about marine manufacturing programme was published on the International Boat Building Industry (IBI) website on 27 February 2023. The headline of the article was "SA marine manufacturing programme boost for recreational boatbuilding sector article".

<https://www.ibinews.com/sa-marine-manufacturing-programme-boost-for-recreational-boatbuilding-sector/44446.article>

AISI GOVERNANCE



The AISI is a fully government-funded industry support initiative of **the dtic** and is hosted and managed at the CSIR. The AISI fully complies with the Public Finance Management Act and operates within the procedural framework of the CSIR. On a quarterly basis, the AISI reports to the AISI Executive Committee on progress made against its approved business plan.



Aerospace Industry Support Initiative

an initiative of **the dtic**

www.aisi.co.za



the dtic

Department:
Trade, Industry and Competition
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