

stainless

steel



the journal of the southern africa stainless steel development association

A NEW DAWN FOR SOUTH AFRICAN PRODUCTS & EXPERTISE?

MOZAMBIQUE – A MILLION DOLLAR MARVEL

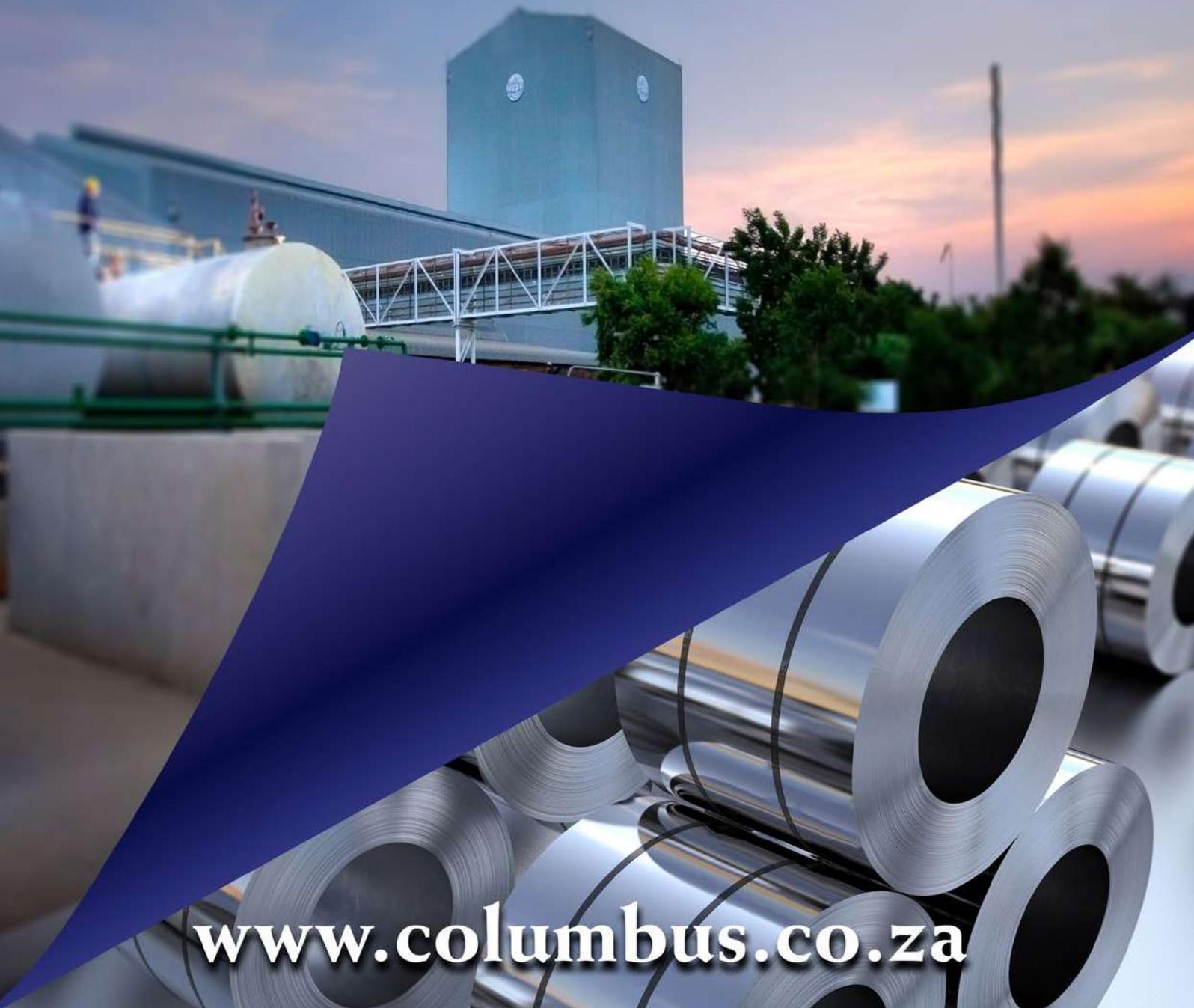
THE TRUE ‘STATE OF THE STAINLESS STEEL NATION’





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Columbus Stainless
Wire Products
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REFLECTIONS AND FUTURE FOCUS IMPERATIVES



As the end of a year approaches, one can usually look back on the preceding months and hold a clear view of what took place. However, 2020 is different. This time it is hard to reflect on a period that is still amidst turmoil and constant change, one in which each of us learns to adapt to new scenarios and, in general, try to regain some sense of normality.

In the stainless steel industry, we have tested our ability to adapt and we are now testing our ability to revive a sector

that has a proud history of more than five decades. Seen in the light of an already weak economy even before the COVID-19 pandemic, this will be a tough task and will require every bit of resilience, strategic thought, and a combined effort from all sectors of industry.

It can be said that 2020 has allowed us to re-evaluate where we are, not only as an industry or as an association, but also as individual links in the stainless steel value chain. At Sassda we have had to scrutinise internal efficiencies, cost-effectiveness,

and productivity. More importantly, we needed to adjust to the new realities and global shifts.

On the global front, the International Stainless Steel Forum (ISSF) has released figures for the first half of the year which show that stainless steel melt shop production decreased by 9.4% year-on-year to 23.7 million metric tons. The USA and Asia (excluding China and South Korea) experienced a contraction of more than 20%. The grouping for Brazil, Russia, South Korea, Indonesia, and South Africa showed an 8.4% contraction.

Statistics for the apparent consumption of stainless steel primary product in South Africa show an annual decline of 28% based on August 2020 figures. This underscores the fact that the local industry is under different pressures than the rest of its peers in the global perspective. Structural problems in the South African economy and policy procedures are not contributing to an easy revival and much will have to be done to strengthen the local value chain to be in a position of sustainable growth and the creation of appropriate jobs.

While the country awaits real implementation of sound policies and industry initiatives, such as the Industrial

Development Plan and the Steel Master Plan, Sasda continues its efforts to liaise with government in this regard. Simultaneously, we continue to add value to membership with increased training initiatives and accessible, hands-on support.

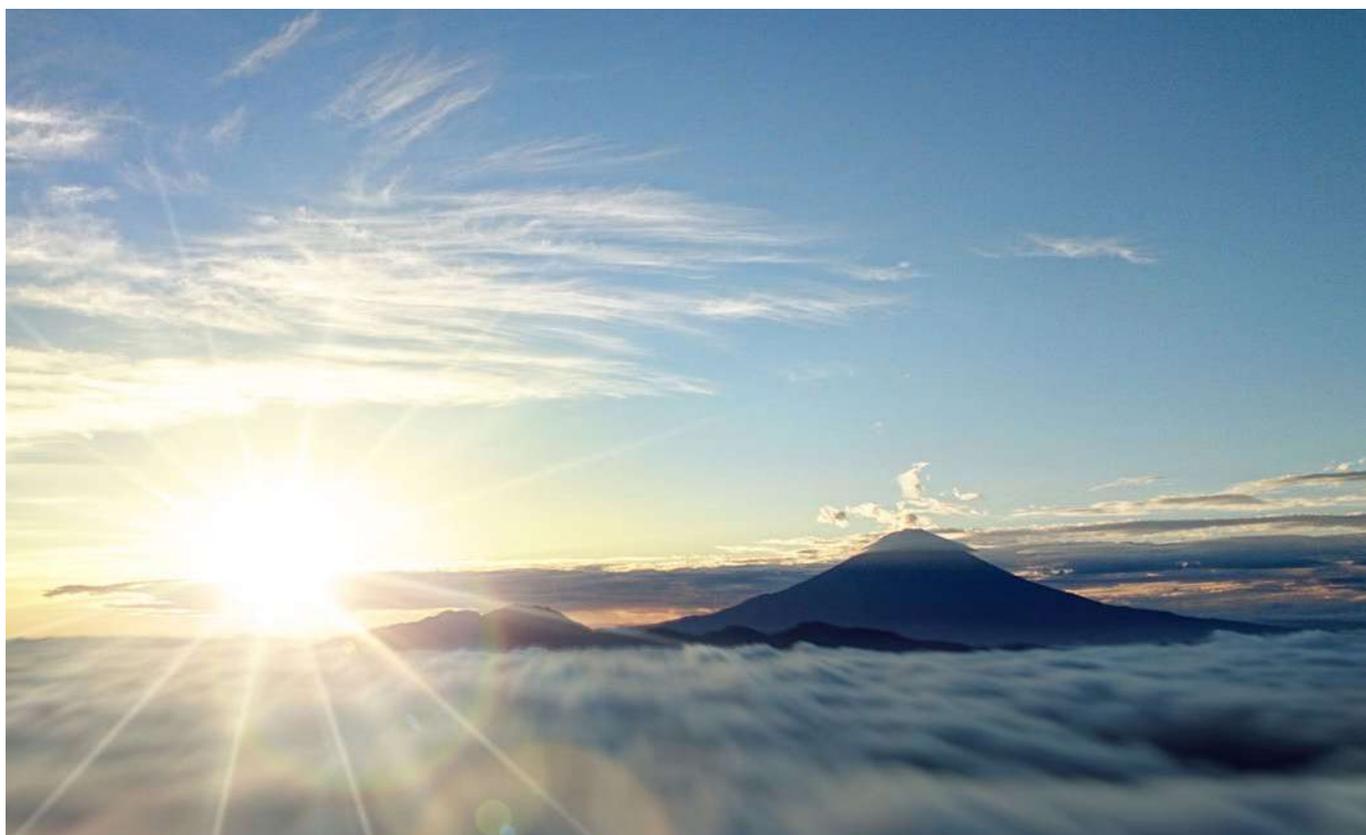
Our 'new normal' right now sees us currently servicing more members in one month than we would in one annual quarter prior to the beginning of 2020. The age of general connectivity has allowed us to stay abreast of developments across a wide range of new contacts and collaborations with peers and organisations which are supportive to our mandate to increase the volumes of locally converted stainless steel.

Stainless steel remains the preferred material in an array of applications where durability and hygiene are of critical importance, and this should give us hope. Reports from fabricating members show encouraging signs of recovery and some niche sectors are doing well. We also still believe that developments in Sub-Saharan Africa in terms of trade agreements can create new markets for our members; localisation or import replacement can create opportunities for local procurement and job creation; not to mention the

potential that might still await from the Mozambican gas fields.

That the road to recovery remains possible is shown in our regular member survey on market outlooks. The latest Sasda index shows a member confidence level of 50,8% - the highest since May 2019. In this issue, we will illustrate why stainless steel remains a cost-effective alternative for virtually every application and how you should go about making sure that you use the optimal grade. Even in tough times, stainless steel remains Simply Brilliant!

Kind regards
Michel



GLOBAL & LOCAL STATS AND ANALYSIS

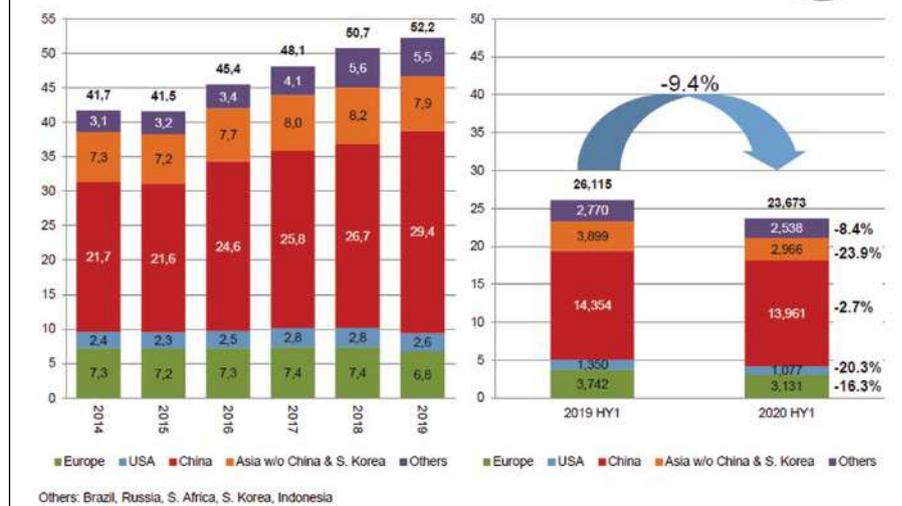
During its annual conference in October 2020, the ISSF released the following statistics on regional and global growth and consumption of stainless steel. Figure 1 indicates that since 2015, global melt shop production of stainless steel has shown a steady increase until 2019 when global production reached 52.2-million tonnes of stainless steel. It is believed that 2020 will see a decline in melt shop production of just less than 10%.

The historic growth rate of stainless steel consumption is indicated in figure 2 and stands at a compounded rate of 5,8%. The same graph shows the growth of plastics. A decade or two ago, plastics were regarded as major competitors. The advent of new grades and applications shows a remarkable breakthrough by stainless steel.

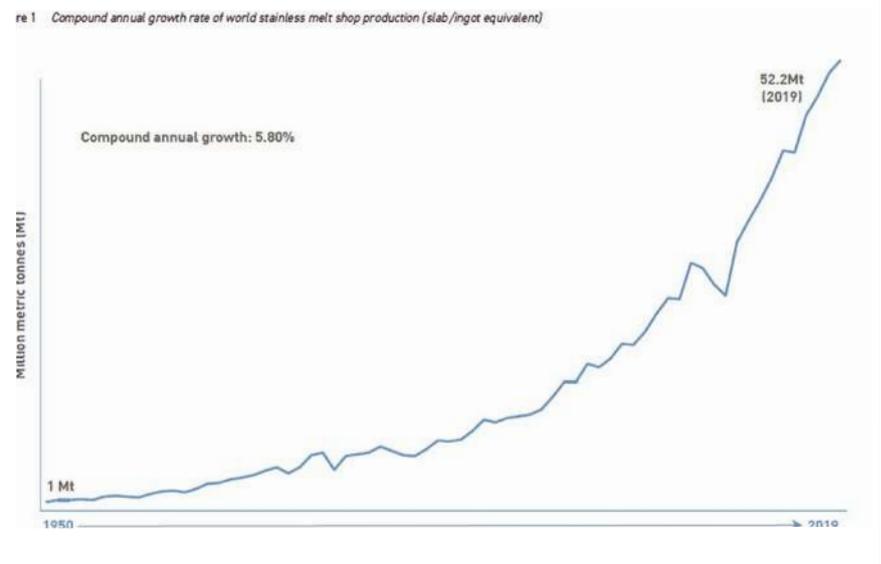
What might be of more practical value is the current global outlook and what the ISSF forecasts for stainless steel. Figure 3 shows the stainless steel consumption for the various global regions. Consumption in China is low, but positive, compared to negative growth for the rest of the regions during 2020. The apparent consumption in Europe and Africa is predicted to have a negative growth rate of between 13% to 119% on the variety of material products. This seems in line with Sassda statistics on the apparent local consumption. Asia, excluding China, is showing similar performance as Europe and Africa, while similar conditions currently prevail in both North and South America.

The expected recovery in 2021 is not regarded as drastic for China, with an expected increase in consumption of between 6% and 10%. Both the North and South America continents are

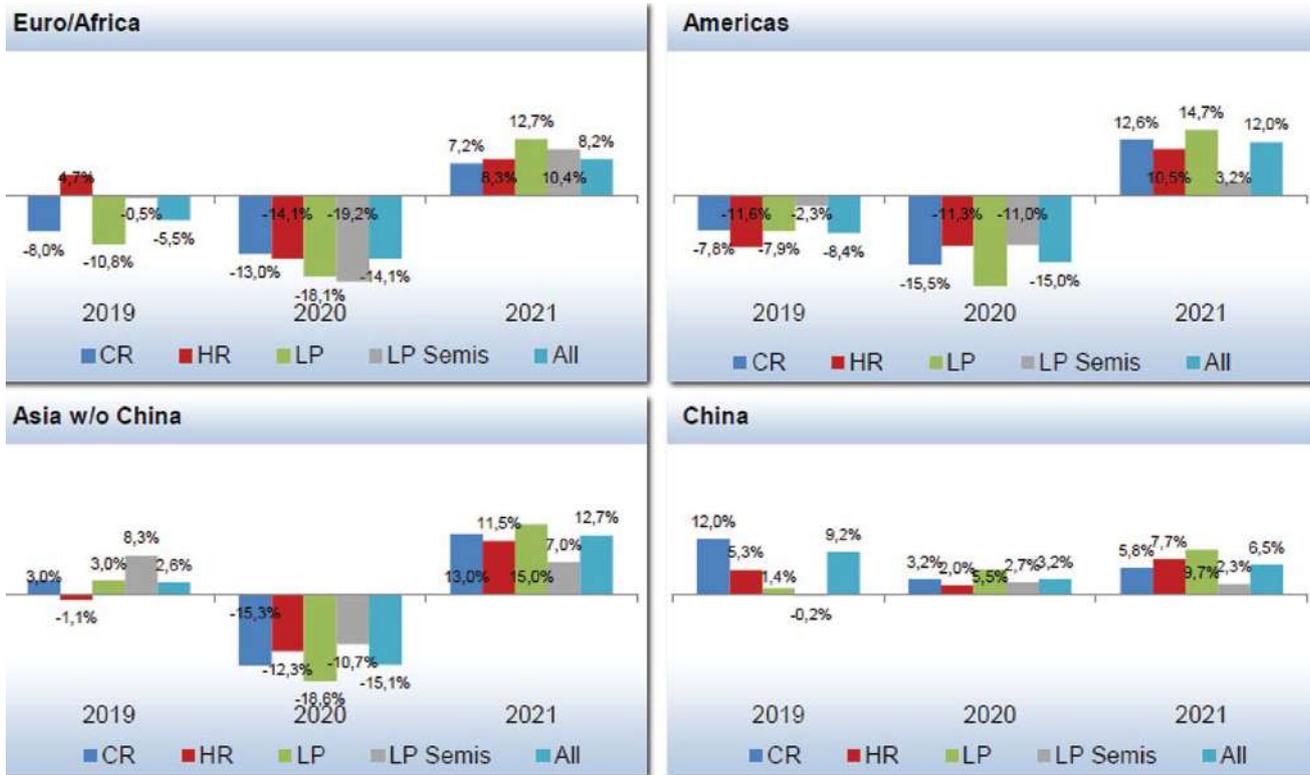
1. WORLD STAINLESS STEEL MELT SHOP PRODUCTION



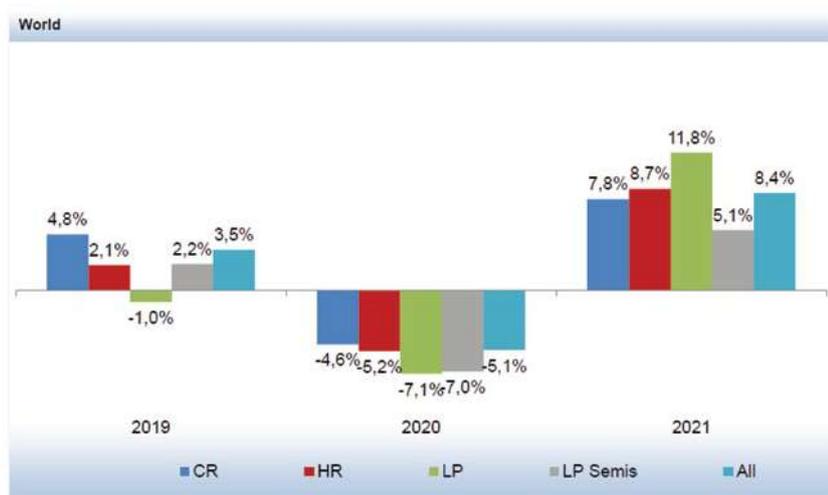
COMPOUND ANNUAL GROWTH FOR WORLD STAINLESS STEEL MELT SHOP



2. STAINLESS STEEL CONSUMPTION YEAR-ON-YEAR



3. STAINLESS STEEL CONSUMPTION YEAR-ON-YEAR CHANGES



expected to see a remarkable 10% to 15% increase in consumption. Africa forms part of the European grouping in terms of steel making, with a forecast of 7.2% as a general increase in the consumption of all products. This is encouraging and

the local stainless steel sector might see local consumption growth in excess of GDP.

Figure 4 illustrates the global snapshot for cold-rolled (CR), hot-rolled (HR), long products (LP) and Semis.

Seen against the historic rate of growth of 5.8%, 2019 did not quite live up to the general trend. From this reduced level of activity, the COVID-19 pandemic added to the dramatic decline in all forms of production during 2020, resulting in an average decline of 5.1%. South African statistics show the local decline was worse, 15 to 20% for 2020, however, the ISSF projection of 8.4% global growth in stainless steel consumptions is encouraging. The prediction for Africa as a region is shown as an expected 8.2% for all products.

The times we live in, make it is risky and even reckless to predict anything. However, international statistics indicate that 2021 might see a long-awaited turnaround locally; good news indeed for the South African stainless steel sector!



ONLINE LEARNING WILL ENSURE SUCCESSFUL GROWTH OF LOCAL INDUSTRY

Sassda has announced the start of its digital curriculum with the first fully online Fundamentals of Stainless training course having launched this month. The course is aimed at bridging the industry skills gap through a paperless and powerful online tool to fast track students towards an accredited and transformed future.

The course will consist of a complete digital curriculum training module which will enable Sassda to bridge the industry skills gap and fast track students towards a more efficient economy at scale.

Tackling education, training and skills upgrading head-on, Sassda's accredited digital training courses promise a paperless and powerful tool to transform students into future leaders.

The Fundamentals of Stainless Steel online class will take the form of presentations which have been revised and made relevant to the new online classroom environment. Students will receive study material in a digital format with modules presented over five parts of approximately an hour each which will be presented as a single module per day. The course is completed by a final online examination.

Using virtual models and simulations, teachers will now be able to communicate material which may have previously been out of reach to students. Video conferencing and social platforms will allow students to communicate with others as well.

Any industry which aims to become competitive, both locally and in world markets, must have both the will and



the means to ensure that its personnel, at all levels, are educated in every aspect of their job.

One of Sassda's aims is to ensure that the facility for this exists and the Association has, therefore, developed this comprehensive online training education faculty which covers the fundamentals for the local industry.

Sassda continues to work closely with targeted universities and universities of technology departments to increase awareness of stainless steel as a material of choice. Sassda also works closely with professional institutions or associations targeted at professionals to increase their knowledge of stainless steel, its properties, applications etc, through approved CPD workshops.

The course will include the basic advantages and classifications of stainless steel. Identify the main

classifications of stainless steel as well as the basic grades, compositions, properties and uses of each.

Students completing the course will know the difference between type, form and finish of stainless steel and be familiar with the SA primary producer manufacturing process. They will understand the difference between flat & long products, castings and tube & pipe, be able to identify the different types of stainless steel contamination, be familiar with the process of the restoration of the passive layer and understand how to clean, store and maintain stainless steel.

Once online learners have completed the digital course, they will receive a certificate of completion.

The first Sassda Fundamentals online course commenced on 10 November 2020.

SASSDA BOOSTS BENEFITS TO MEMBERS WITH ADDED-VALUE MEMBERSHIP TIERS

As one of the most active stainless steel industry associations in the world, Sassda has been intrinsically involved in increasing the awareness and use of stainless steel in Southern Africa since its inception in 1964.

Practised at adapting to existing market influences over the associations lifetime, Sassda has once again tackled industry disruption brought about by the COVID-19 pandemic by adding value to its new and existing members through a tiered membership structure which streamlines and targets their pursuit of promoting the sustainable growth and development of the industry; with the main emphasis on stainless steel converted within the South African economy.

Now offering a comprehensive list of services to its wide-ranging member base, including technical information and advice, education, training and skills upgrading, a range of publications and marketing, and industry and business development support, Sassda's new tiered membership structure will allow its members to choose from a bouquet of benefits according to their industry focus and manufacturing needs.

As the only local association that has all its services and products in easy-to-deliver packaging available online, Sassda has placed the power in its member's hands, allowing each member organisation to be in control of maximising the value and delivery of services according to their membership structure.

In the past, Sassda's value to members was service-based according to member requirements. The new structure leads the association into the new future with a 'user pays' principle according to a basket of defined value-adding items on the table.

Sassda Acting Executive Director Michel Basson comments; "Our members now know exactly what the full value of membership entails, and they can take advantage of the value at



any time. They can now even customise their basket of services to add maximum value,"

"In line with our goal of pioneering a new approach to stainless steel in South Africa, we are pleased with having identified a range of potential projects for the 'new look Sassda' to deliver enhanced returns on member investment."

Comprising a set of competitive membership packages, which are based on cost and inherent added-value, each package is tailor-made for the size of members' operations, as well as the number of employees within an operation specifically assigned to the production of stainless steel. Among these developments is the conversion of Sassda's existing Fundamentals course to an electronic-learning course to increase accessibility.

The new model puts the power back in the members' hands across a range of proven technical support and advice, world-class training, marketing for your business, solid sales leads, effective lobbying and export promotion and

increased influence, and networking opportunities where members will at all times be in control of maximising the value of membership.

"Whilst our website is packed with information that covers all aspects of our industry, there will be areas on the site only accessible to members. In the Members Only zone there will be information and products only available to Sassda members, including documents, statistics as well as member-specific products such as the Information Series," confirms Basson.

As an added benefit, the Sassda COVID-19 33,3% membership discount makes it possible for all current members to keep membership through the challenges posed by the economic effects of the virus. This discount is only applicable to members for the duration of the 2020 financial year.

Membership of the Association is open to both National and Sub-Saharan Africa companies and individuals in good standing involved in the production, distribution, fabrication, conversion and use of stainless steel.

UNITING BUSINESS INTERESTS IN AFRICA

The South African United Business Confederation (SAUBC) was established in 2018, following the election of the new President of the Republic of South Africa, and his support of the Thuma Mina principle of improved service delivery for the reconstruction and recovery of the South African economy.

SAUBC's co-founders and first President is George Sebulela, the former Chairman and Secretary General of the Black Business Confederation (BBC), President of African Entrepreneurs Confederation (AEC), and President of Oil & Gas Business Confederation (AOGBC).

SAUBC is a non-profit and non-racial business and economic federation that represents cross-cutting business interests in South Africa. SAUBC consists of members representing Export Councils, Industry Associations and Joint Action Group, and currently encompasses 55 member organisations.

The Vision of SAUBC as a comprehensive Business and Economic



Federation is to make the Republic of South Africa and Africa, the preferred investment destination in the world.

At its launch, SAUBC President George Sebulela said; "the SAUBC is the answer to the need for a strong pan-African, industrial and export-focused business body that will lead

South Africa's industrial resurgence, unlock the huge agricultural potential, optimise the international value chains and embrace the benefits of the Fourth Industrial Revolution."

In line with and in support of this statement Sasstda became a member of SAUBC in 2019.

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YOUR GLOBAL VIEW ON THE WORLD OF STAINLESS STEEL

Amidst the daily reality of the current financial crisis we feel it's important to use this time to strategise and adopt a forward thinking growth mindset. For that reason we put together a monthly package of articles that provide market intelligence from across the globe and Southern Africa. Here we're proud to present our latest picks of the top articles from the past few months

1. NEW STUDY PROVES STAINLESS STEEL HAS IT ALL!

Stainless steel supports many essential applications in our modern world and with sustainability high on the world's agenda, there is an increasing call to quantify the material life cycle of stainless steel and their efficiencies from production to fabrication, manufacturing, use, recycling and disposal.

The latest results from a study titled 'The Global Life Cycle of Stainless Steels' quantify the stocks and flows cycle of stainless steel, confirming its high end-of-life recyclability and high recycled content; clearly demonstrating stainless steels credentials as a sustainable material of choice.

[READ MORE](#)



2. REVIEW OF NINE AFRICAN 'BLUE ECONOMY' PROJECTS SHOWS WHAT WORKS AND WHAT DOESN'T

A recent report reviewing nine case studies of blue economy projects across the continent has found that while governments had the right intentions albeit with a focus on economic outcomes, social equity and ecological sustainability got limited attention.

The report's findings reveal how coastal states with blue economy goals must reconsider their strategies or face the negative consequences which can lead to instability or secessionist movements.

[READ MORE](#)

3. TESLA'S CYBERTRUCK IS AUDACIOUSLY AUSTENITIC

A proprietary 301-series stainless steel gives Tesla's first electric pickup truck strength and durability beyond that of its competitors. Due to start production in late 2021, Elon Musk described the corrosion-resistant, 3-mm-thick sheet specified for Cybertruck as "ultra-hard 30X cold-rolled stainless steel," indicating an alloy variant developed from 300-series stainless steel.

It's not the first attempt at a stainless steel car following attempts by DeLorean, Ford, and even Porsche; but what is different is Tesla has engineered a material and manufacturing solution that requires minimal forming operations, enabling huge potential savings in presses, dies and related operations for its radical new pickup.



[READ MORE](#)



4. THOUSAND YEAR OLD PRECURSOR TO STAINLESS STEEL FOUND IN IRAN AMAZES ARCHAEOLOGISTS

Chromium steel, commonly referred to as stainless steel, is thought to be a recent manufacturing innovation, but new evidence suggests ancient Persians stumbled upon an early version of this alloy 1 000 years ago, in what is a surprise to archaeologists.

According to new research published in the Journal of Archaeological Science, Ancient Persians were forging alloys made from chromium steel as early as the 11th century.

[READ MORE](#)

5. FIRST THERE WERE THREE AND THEN THERE COULD ONLY BE ONE

The Apple Watch Series 6 is the most advanced wearable that Apple has ever made and is available in three versions - aluminium, stainless steel, and titanium. Featuring the same hardware and software features - they can track your heart rate, measure your blood oxygen levels, monitor your sleep - the questions is which is better? Aluminium or stainless steel? Apple calls on consumers to look at durability, weight, price and peace of mind when making their personal preference.



[READ MORE](#)



6. ROBOTS, PIGS AND PIPES HAVE MORE IN COMMON THAN YOU THINK!

What began as a pipe dream, the UK's Project GRAID has since produced ground-breaking robots which eliminate the logistical and environmental impacts of gas line excavation by taking measurements from inside the pipe.

Posing many complex engineering challenges, 2507 super-duplex stainless steel was chosen for the robot's chassis - an agile robotic inspection device, required to operate in high velocity pipe labyrinths, live gas and extreme pressures - equivalent to more than five times the maximum pressure experienced by a typical submarine.

[READ MORE](#)

MOZAMBIQUE OIL & GAS PROJECT POINTS TO LARGE SCALE SUPPLIER OPPORTUNITIES

Currently, the world faces two global challenges: the impact of COVID-19, coupled with a global energy transition away from coal and oil to natural gas centred locally around the developing Mozambique hydrocarbon industry; one which promises opportunities in boosting South Africa's mid and downstream economies, together with regional employment and career upliftment.

This was highlighted in a recent two day joint Mozambique government and South Africa's the dtic virtual conference where Sasdda is aligned and well-positioned with access to industrial project opportunities that will benefit its Southern Africa members over the areas of policy, commerce, industry, supply chain and finance.

Speaking at the Mozambique Gas Virtual Summit, **Strategy & Africa South Market Lead – Energy for PwC South Africa, James Mackay** said that economic pressures due to COVID-19, together with a fall in demand for oil, has left Africa feeling the pressure in its transition to renewable and green energy futures. However, he confirmed that Mozambique offered an extraordinary resource for future opportunities.

"Predictions show that by 2050 as much as 80% of world's energy will stem from optimal renewable energy resources, which will see a further boost in demand for green hydrogen from natural gas to create an extended and positive demand for clean energy into the future."

With the focus on regional and economic inclusive growth and local content and industrialisation in Mozambique,



Mackay, however, urged the private sector to move quickly in its drive for regional development opportunity.

PRODUCTION AND DOWNSTREAM PROSPECTS

This optimism, and urgency, was iterated by **Simone Santi, Vice-president for International Affairs at Energy/O&G/ MineralRe CTA** who is based in Vilanculos in the Inhambane Province where he oversees entrepreneurs and bilateral organisations in oil and gas mineral resources working within the associated Chambers of Commerce.

"Mozambique's 5-year working developments for upstream Liquefied National Gas (LNG) projects has two mega projects online. We are set to receive the first floating LNG unit by ENI and by 2022 we will see the first



of Professional Competence (APC) contractor within Mozambique's local construction and manpower sector; one which allows for international and local private sector applications and local industry in manpower, coating, cables production, NDT, welding, fuel and diesel, electrical, installation, transport, maintenance and civil and mechanical works.



“Another big opportunity is domestic gas use where we are seeing partnerships and service provider opportunities created to transform the local economy for internal consumption,” said Santi.

Domestic gas projects in Mozambique will create a multiplier effect for the economy where LNG construction projects contribute to an added value through development and upskilling of the local workforce, building infrastructure and by driving knowledge transfer of sustainable business opportunities for local and international enterprises.

PUBLIC-PRIVATE PARTNERSHIP ADVANTAGE

In partnership with the Government of Mozambique, the aim is to maximize local participation. According to Santi; “We see public-private partnerships starting from a training opportunity and the transfer of knowledge as

the long-term business drivers in economic diversification, which will engender cost reduction and qualitative and competitive advantages within Regulatory and Legislative requirements. Training and Train the Trainer opportunity is already seen at the IFPELAC Training Centre in Pemba, operated by Saipem, at Donellli-Unilurio in Pemba and CGG for technical interpretation and training at the University Eduardo Mondlane.”

Santi emphasised they would avoid monopoly and create transparency and the promotion of international partnerships in consideration of Emission Control Areas (ECA) and local content plans by defining mega projects within a ring of goods and services where business prospective can apply according to Oil & Gas regulatory law. Business agreements would be overseen by joint working groups between Mozambique’s Confederation of

Economic Association (CTA) whereby 50% of costs would be shared between the CTA and Government for locally registered companies with most shares owned in Mozambique.

SASSDA’S FAST TRACK TO DOING BUSINESS

In light of these developments, Sassda Head of Market Intelligence & Exports, Lesley Squires, voiced the need for members to update their training imperatives. These include material selection and advanced stainless steel knowledge which Sassda is currently making available via webinar and in-person wherever possible.

“Sassda is on the board of the South African Institute of Welding and we would like to include them in our business submissions. They have a range of training courses, not specific to stainless steel but inclusive of it.

“Concerning the Mozambique LNG project, most oil and gas companies will be sourcing via their preferred suppliers, but we have identified the opportunity for local product supply to hospitals, clinics, hotels, and consumer goods such as sinks, pots, pans, cutlery etc.”

As one of the most active stainless steel industry associations in the world, Sassda members are encouraged to make use of their membership and the support the association provides through technical information, advice, education, training and skills upgrading.

UPDATE!

Following the webinar in September, four working groups have been formed to facilitate South Africa’s participation in the project namely: Logistics, Infrastructure, Agriculture and LNG. Sassda is participating in the Agriculture work group as it sees the need for food and beverage and agro-processing equipment, much of which will be in stainless steel, as well as the LNG group for any opportunities for its members in both areas.

For more information please e-mail lesley@sassda.co.za

THE CHINA SYNDROME

In the past two decades China has conquered the global stainless steel market. Stainless steel is vital to virtually every other sector, and production is growing faster than that of other metals such as lead, copper, and aluminum.

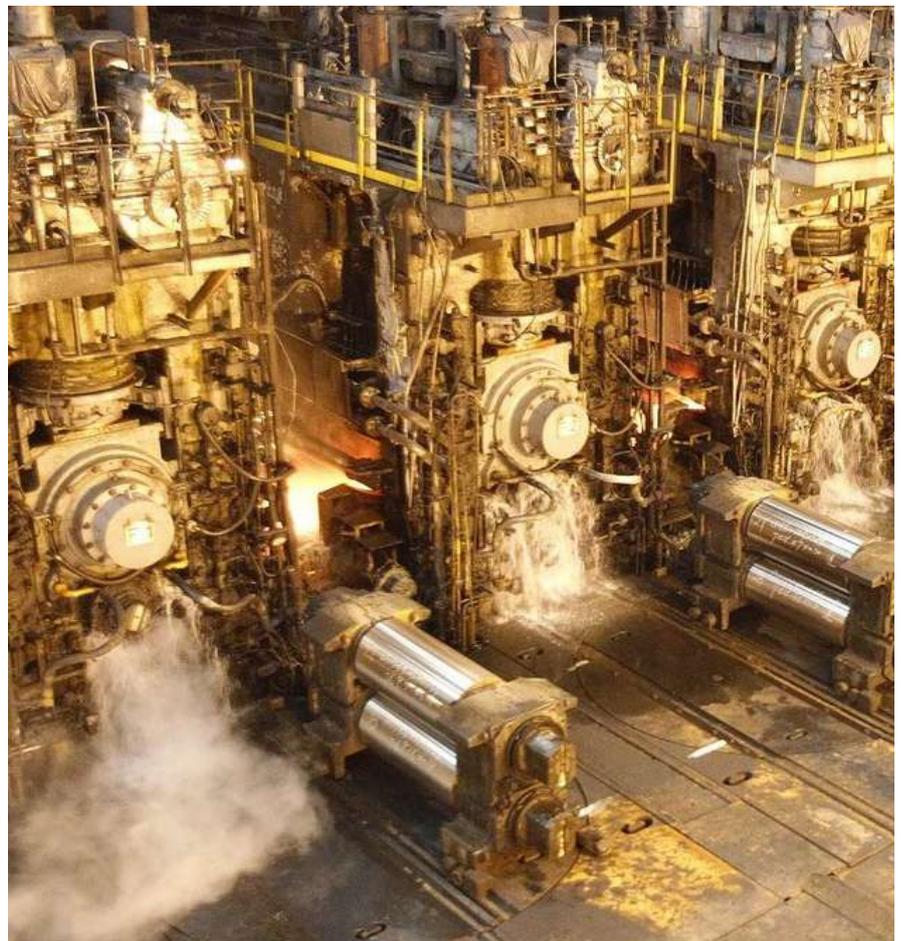
However, whenever a discussion of local conditions takes place, there is some debate over the unfair trade practices in China which are having a negative impact on local manufacturers. There is a constant argument that Chinese trade practices are sometimes in contravention of World Trade Rules. However, in some cases they are generally accepted and hence competitor countries need to find a balance in the way they trade with China.

When speaking to our members on this issue, most do not expect government to render unfair support to expand business or be more competitive. Most members have confidence in their ability to be globally competitive if competing on normal business principles.

According to WTO rules countries cannot develop country specific tariffs. Member companies are encouraged to supply Sassda with any evidence or suspicions of unfair trade practices such as dumping or unfair subsidies. Sassda will conduct background research and escalate the matter to ITAC via dtic if there is merit in the complaint. It is therefore the role and responsibility of individual member companies to bring to our attention, and thus the attention of government where they find or suspect unfair trade practices.

A REALISTIC ASSESSMENT

The Chinese steel industry is (as is most of the Chinese economy) complex and is largely government owned. Therefore, many products are often not priced in the same way as products from competitive



traditional capitalist factories. This is considered non-competitive according to WTO definitions.

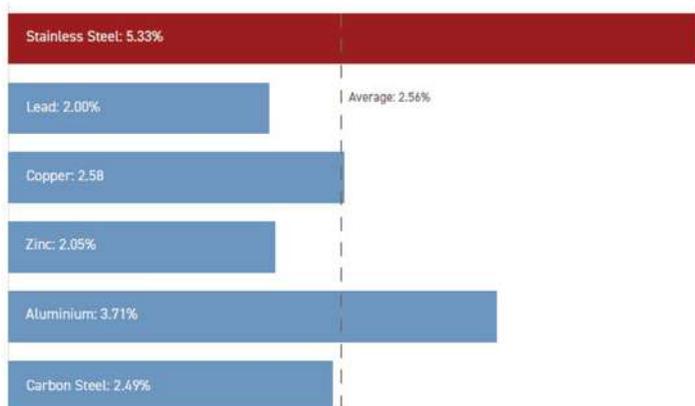
By this time, we are all aware of the subsidies and advantages Chinese manufacturers receive in the form of land, equipment, material, energy, transport and even export value add. On the other hand, it is also known that labour in China is on average more productive than in other countries based on their six day work week and limited public holidays. The number of hours spent at work is therefore much higher for most working Chinese, when compared to other countries. Hence, when comparing Chinese and South

African wages, the cost structures are hard to measure and compare. According to various research studies the Chinese government is willing to subsidise a variety of products to gain market share. Value added steel products fall in this category and, in many cases, the product is sold at a rate below the true value.

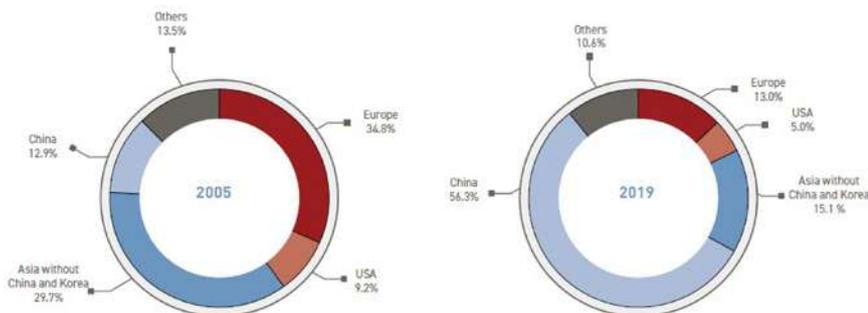
It is becoming clear that Chinese manufacturers are not necessarily more cost competitive than local member companies when the comparison is based on efficiency or technological superiority but rather because of government support mechanisms.



**FIGURE 4
COMPOUND ANNUAL GROWTH RATE OF MAJOR METALS (%/YEAR): 1980-2019**



**FIGURE 2
REGIONAL SHARE OF STAINLESS STEEL PRODUCTION
OTHERS: BRAZIL, RUSSIA, S. AFRICA, S. KOREA,
INDONESIA**



In South Africa we do not necessarily want a portion of the Chinese market, but in a battle for survival our local manufacturers only want to retain their current market. This does not mean your manufacturing business cannot compete on a global level. Here are some tips on how to compete against offshore manufacturers, even as a small business.

- **Do not Try to Compete on Price** - Differentiate your product rather on quality, service, and value for money.
- **“Made in South Africa”** - Many South Africans will be willing to pay a small premium for a local product due to their solid track record and current higher levels of trust and increased accessibility due to the COVID-19 pandemic and its effect on cross border trade.
- **Focus on Quality** - Customers are often willing to pay more for quality products that represent value for money. Be specific in your labeling and marketing around the quality aspects that set your products apart from the competition.
- **Certification** - Certifications indicate specific levels of quality, testing and performance. Customers tend to trust these third parties more than your own marketing claims. Overseas competition does not always conform to standardised norms. From a maintenance and life cycle costing view, this is important to first world markets.
- **Community focus** - “Buy South African” has become a popular sentiment. In the area where your business operates, get involved and provide an open and active presence in the community.
- **Focus on Service** - Creating a great customer experience through service excellence.

case study

3CR12: THE COST-EFFECTIVE METAL OF CHOICE

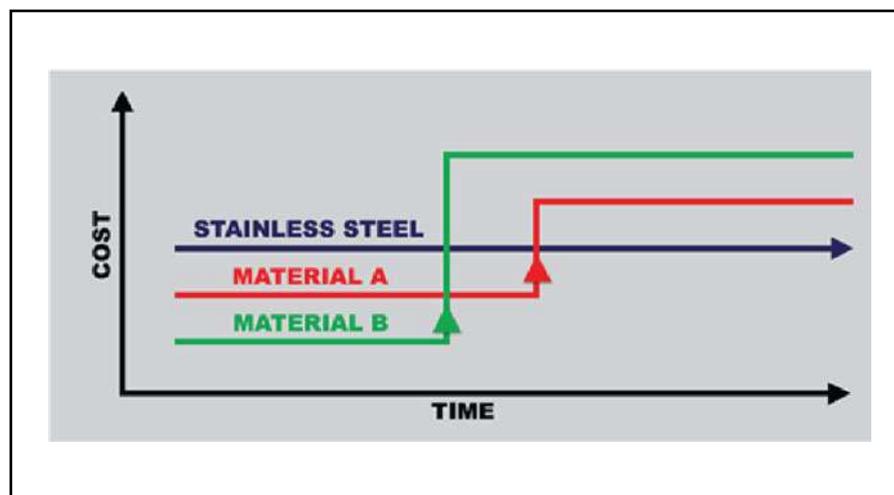


The manufacturing industry as a whole is under great strain, especially in this tough economic climate. With these pressures in mind, one has to consider the financial attributes to any project, structure or equipment. Corrosion is a phenomenon that plagues most industries and has dire financial consequences due to reduced equipment lifespan. Stainless steels are known to withstand very harsh operating conditions and are therefore specified in applications requiring superior corrosion resistance. There is however an industry perception that stainless steel is very expensive. This is where the importance of life cycle costing (LCC) must be used as it considers the total project cost implications; taking into consideration the initial material cost, fabrication costs, maintenance and refurbishment costs, cost of lost production due to downtime and possible replacement cost over a defined products' lifespan. In most applications,

stainless steel becomes the most cost-efficient and realistic solution.

Corrosion is defined as the process of gradual destruction of materials by a chemical reaction with its environment. It degrades the useful properties of metals and structures including strength and their structural integrity

as a result of mass loss and inevitably perforation. For example, carbon steels are made from iron and a combination of other alloying elements. Without any surface protection, they tend to form a coating of rust (iron oxide) which is brittle and exfoliates, exposing a new fresh surface of steel to be attacked by



the immediate environment. This cycle continues with devastating effects on equipment and structures. Stainless steel also contains mostly iron but also contains chromium that forms a thin, tenacious and self-repairing passive chromium oxide layer on the surface of the steel. This oxide layer gives the steel its characteristic corrosion resistant properties in most environments. The steel must contain a minimum of 10.5% chromium for this passive layer to form. Stainless steel is known for its superior corrosion resistance and mainly used in the bare mill finish without the need for additional protective coating systems to enhance corrosion protection.

In the 1970s, Columbus Stainless developed 3CR12®, a Chromium Containing Corrosion Resisting steel with a nominal 12% chromium. This utility stainless steel was originally designed to bridge the gap between coated carbon steels and the higher grades of stainless steel in structural applications. 3CR12® is considered a durable, multi-functional and adaptable metal, whilst still upholding the other benefits of stainless steels. These include:

- strength – similar to most structural mild steels;
- good corrosion resistance and excellent properties in wet-abrasion conditions; and
- good welding properties, even in thick sections greater than 8mm (even up to 30mm).

Applications are widespread and include materials handling environments in mines and coal wash plants. It is used for applications such as ore cars and wagons, chutes and launders as well as shaft steelwork, chimney stacks, ducting, roofing and cladding (most commonly poultry and piggery buildings), walkways including grating, handrails, stairs, electrical boxes and security fencing. It is also widely used in sewage processing plants, municipal water storage tanks and even in the food industry for various processing equipment and conveyor systems.

We have selected two practical examples of the impact of life cycle costing on material choice, to show the importance of selecting the correct metal of use for cost savings.

CASE STUDY: COAL WAGONS

In 1985, trial coal wagons were manufactured out of 3CR12® in the hot rolled and annealed (HRA) condition. These wagons are used to transport coal between Ermelo and Richards Bay. They have a payload of 80 tons and make the journey roughly five times a week. Before 3CR12® the wagons were made from Cor-Ten, but these only lasted 8-12 years, with refurbishment required after 5 years due to heavy corrosion damage.

Over the years, inspections of these coal wagons have been conducted, of note, the study done in 2012, after 27 years of service. The wall thickness of these coal wagons was measured using extensive ultrasonic thickness measurements. The mild steel wagons recorded corrosion-abrasion wear loss of 160µm/yr. This is attributed to the surface rust or iron oxide being removed, exposing fresh steel. The fresh steel in an oxidising environment reverts to its natural iron oxide state, forming a continuous corrosion cycle.

Compared to mild steel, stainless steel forms a very thin, tenacious oxide layer which gives it its characteristic corrosion resistance. The metal loss of 10µyr was recorded for 3CR12® wagons in this application. From these measurements, 3CR12® coal wagons in this environment have a predicted total life of 65 years. Mild steel wagons would have to be replaced 8 times in this time, increasing costs and potential lost production time. (Note: Initial projections were 20-year lifespan, however, the stainless steel units have surpassed this estimation three-fold and counting.)



CASE STUDY: 3CR12 IN THE SUGAR INDUSTRY

Stainless steels were first introduced into the South African sugar industry over 40 years ago. Before this, carbon steels were predominantly used for the structural and processing equipment, with stainless steels' only used in form of 430 tubes. Even then, the stainless steel industry was met with great resistance to use stainless steel in the sugar processing plants due to its perceived

high cost, which deemed it not suitable for the industry. Since its development, 3CR12® has seen worldwide success in the sugar industry and is used from cane handling to the final product.

During the sugar manufacturing process, the input sugar cane is not washed before cutting and crushing in the mills. Together with the cane, there is a presence of sand and stone,



which contribute to the aggressiveness in prevailing wet abrasion corrosion conditions that exist. With mild steel, abrasion removes the corroded layer and exposes fresh reactive surfaces for further corrosion to take place. This exaggerates the high maintenance costs due to the replacement and repair of equipment due to corrosion and wet abrasion corrosion. 3CR12® excellent wet sliding properties and corrosion resistance improve both the longevity of the handling equipment and the flow of materials in this equipment. When cost per unit loss by corrosion abrasion is taken into account, 3CR12® exhibits a far superior performance to other grades tested. See graph below.

This has made it popular in most cane handling and bagasse applications (e.g. liners on cane carriers and deck plates on inter-carrier and disposal carriers), flue gas ducts, vapour extraction hoods, mud agitators, syrup storage tanks and sugar storage bins. The major advantages obtained with the use of 3CR12® in the sugar industry since the 1980's include:

- savings in the initial

installation due to the reduction of wall thickness: high strength and corrosion resistance result in less corrosion allowance. For example, wall thickness savings of up to 18% have been reported for conveyor belt side plates on initial installations;

- increased life expectancy of the equipment by 5 to 10 times that of mild steel;
- reduction in maintenance (i.e. cleaning, refurbishments) and production downtime.

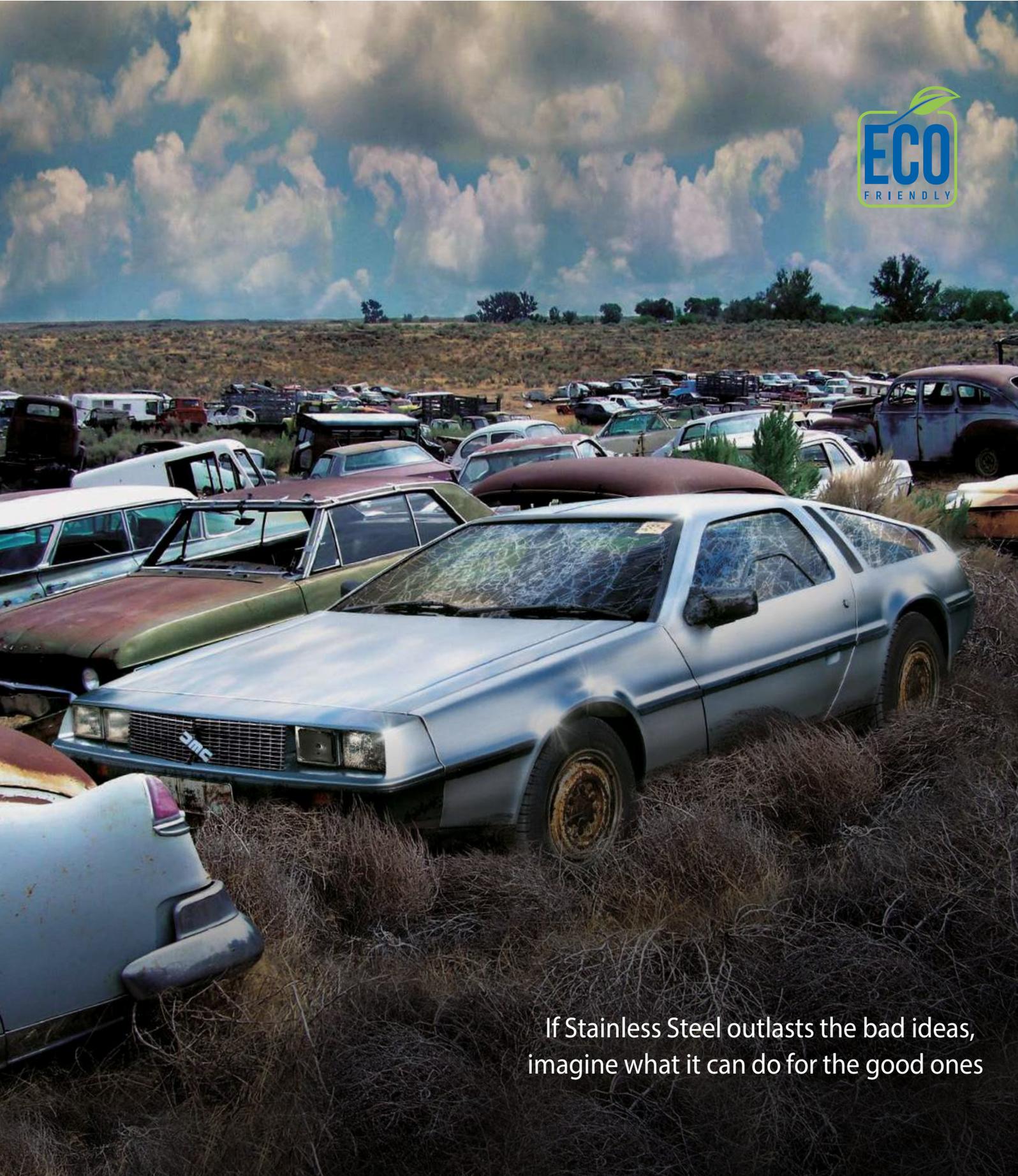


Life cycle costing is an invaluable tool that highlights stainless steel as the most cost-efficient metal of choice in most applications. Achieving considerably longer life expectancy than that of mild steel, it is easy to see why 3CR12® has realised great successful applications throughout the world and has proven itself as a cost-effective solution to corrosion in a wide range of structural applications. As with other stainless steels, 3CR12® contributes to sustainability, being completely recyclable and manufactured using recycled material. Indeed the future of cost-effective manufacturing is Stainless.



Process Flow Diagram with typical 3CR12® Applications





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CODE	MACHINE DESCRIPTION	RATED INPUT VOLTAGE
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41-310208-11	ZEUS CUT 80	3-PHASE AC 380V
41-310210-11	ZEUS CUT 100	3-PHASE AC 380V
41-310216-11	ZEUS CUT 160	3-PHASE AC 380V



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SUPPLY CHAIN GAINS MEAN IT'S HOLLOWARE'S TIME TO SHINE

Can the Epidemic lead to growth in the local Holloware Industry?

When South Africa's 58-million strong population commemorated Heritage Day this year, for the most part it was celebrated around a shared meal with family and friends while under COVID-19's Lockdown Level 1 protocols.

Yet, despite a current market demand for cookware, South Africa's stainless steel holloware (pots and pans) and flatware sectors (cutlery, trays and serving dishes) are facing an undetermined future; with local manufacturers compelled to import their stainless steel to benefit from

competitive pricing; and local retailers preferring to source, stock and sell imported products from the East.

With the sudden shifts in global trade regulations and health restrictions brought about by the epidemic, the traditional supply chains, import and export controls, and manufacturing models have been disrupted.

The question now lies as to how the future can be transformed through localisation, government and regional policy, and robust business growth strategy for growing the potential for local production, distribution, and extended export markets into Africa?

POSITIVE MOVES

According to Sassda Market Intelligence and Exports Specialist, Lesley Squires, the local holloware manufacturers will be feeling the market effects of the epidemic, but this will be dependent on the market demand for the range of products which the manufacturer supplies to market. "We are, however seeing some positive moves in the development of the local sector, for example, AMC Holloware has remained consistent as their products have a solid heritage within the local market and are therefore a popular family and wedding gift item. "Another local producer

Hendler & Hart have also engaged in an intensive 18-months revamp of their manufacturing facility. With a new plant and equipment, they expect to start production shortly with the relaunch of their Aloe brand.”

According to Squires, the biggest obstacle facing local development is cheap imports into the market. “Despite the SABS specifying stainless steel grades 304 and 430 in all holloware products sold locally, many imported products are made from cheaper stainless variants. This means there are large quality variances in the holloware products sold in South Africa, which consumers only discover when they start using a product and experience substandard performance.”

On a more positive note, in terms of future areas of growth for the holloware sector, Squires reports that the government’s Steel Master Plan is currently looking at the designation of local holloware products. This would mean that state institutions such as prisons, hospitals and schools would be required to use these products.

Looking further afield, African export markets also still represent a lucrative market with Sassa members operative in Tanzania, Kenya and the coastal regions of Mozambique

supplying the hospitality sector with room for this aspect of their export sales to grow.

LOCAL MUST BE LEKKER!

For local manufacturer Le Morgan, that manufactures a range of exclusively designed cookware products, they choose to follow a growth strategy within the current evolution of their company.

Having already rallied against and realised growth within local market challenges, Le Morgan CEO Graham Morgan says, “There is a huge potential market that could support job creation in local holloware manufacturing, but there are also many challenges still to be faced. With no support or benefits available from within the industry, we have managed to establish ourselves independently; to the extent that we are now at the stage where we are moving to larger premises.

“Unfortunately, we have been forced to import raw materials which are cheaper than buying from local agents. If local manufacturers continue to be ignored by South African retailers, very few manufacturers of hollow cookware will survive this period.”

Le Morgan can attribute most of their success to a direct supply chain

to consumer demand thereby cutting out the middleman. In 2018, they were also pre-emptive in supporting this demand by importing several new pressing machines, washing tunnels and polishing machines to speed up their manufacturing process.

“We have recently introduced five new designs of aluminium cookware sets to launch before the end of this year, which will immediately create new jobs for the Stanger area in KwaZulu-Natal,” confirms Morgan.

The company is also set to explore the lucrative export market opportunities into the rest of Africa and have plans to display its products at global trade shows by the end of 2021.

With aspirations to not only see growth in their manufacture of high-quality stainless steel cookware, the company has also started redeveloping their processing in their aluminium range, moving from brazing aluminium bases to impact bonding. With a completely new set of tooling for high-quality cookware sets and a cheaper range of tooling for a budget range of cookware onboard, Le Morgan also announced the launch of their new website this month.





‘NO FLASH IN THE PAN’: Betterect and DryTech International achieve a trio of mineral concentrate drying plant successes

Betterect, a South African fabricator and erector of large processing equipment structures, undertakes steel fabrication projects within the mining, petrochemical and other industries, for clients as far afield as Austria, Italy, Germany and Australia, as well as throughout Southern and Central Africa. With more than four decades in the industry, they are the recognised leaders within their field.

As such, Betterect has conceptualised and developed the ‘Team Africa’ concept, in which steel industry suppliers and manufacturers join forces and share skills and expertise to supply mining, power generation, industrial and other sector projects throughout Africa, thereby enhancing commercial activity and boosting economic growth on the continent.

A keen participant in this concept is DryTech International, which was established in 1983 and is a world leader in mineral concentrate drying, as well as supplying robust and durable

processing equipment. Through their extensive pilot plant facilities, DryTech offers a range of innovative, productive and efficient high-tech engineering solutions for the drying and processing sectors of a variety of industries — both locally and internationally — including fine chemicals and polymers, web and textiles, pulp and paper and biomass sectors; and also specifically, for many key mines around the world.

Recently, DryTech International commissioned Betterect to undertake the fabrication of a flash drying plant on a South African platinum mine, as part of the mine’s objective to increase production.

Francois Herbst, Project Engineer at Betterect points out: “Betterect has partnered with DryTech International previously and we enjoy an excellent relationship, which has seen us achieve several flash drying plant project successes since our first collaboration.” Juan Horstmann, General Manager of DryTech International underscores

Herbst’s observation: “We are no stranger to Betterect’s expertise and since 2016, have collaborated on no less than three flash drying plants on mines both locally and in Africa, using our combined skills to achieve excellent results for our clients.”

Betterect’s fabrication processes are renowned for their adherence to the strictest standards of production. The company has also invested substantially over the past five years in the latest pulse arc welding technology, which assures excellent weld technology while reducing welding time.

“The flash drying plant was fabricated from mild steel at our workshop in Chamdor, Krugersdorp, with all manufacturing executed according to stringent quality assurance and project management protocols, in accordance with ISO 3834 part 2 standards. Betterect also undertook transport to site, and installation of the flash drying plant on site.”

Herbst describes the previous

collaborations in more detail: "On a local platinum mine project in 2016/2017, Betterect undertook the detailed drawings, fabrication, rigging, installation and transportation of the flash drying plant, which was manufactured predominantly from mild steel with stainless steel handrails and gratings. We also conducted a tandem lift of the product dry bin - with dimensions of 5 x 12 metres - using our own 160-ton and 20-ton cranes, onto the abnormal load flatbed vehicle for transportation to site.

"For a project in Zimbabwe, a fluid bed combustor upgrade was required, comprising mild steel fabrication. Betterect fabricated and installed this; while for a project in Rustenburg, a retrofitted flash dryer was refurbished by Betterect, using mild steel."

True to Betterect's exceedingly high standards, on each project, all fabrication took place according to the most stringent fabrication standards criteria in its Chamdor facilities in Krugersdorp, Johannesburg.

"This type of close teamwork is what gives Betterect and its partners a competitive edge when undertaking projects locally and in Africa — for both local and international clients alike - while practising the true ethos of the 'Team Africa' concept," Horstmann adds.

"This level of expertise and professionalism is why Betterect is our preferred installer and fabricator," Horstmann remarks, emphasising that it is this consistent service which is also beneficial to them as a client, giving them confidence in the quality and reliability which Betterect stands for.

Horstmann says: "DryTech International's developments and advances over the past 39 years have made us experts in process design and nothing is a case of 'one-size fits all', as every drying plant we develop is bespoke, down to the finest details. In essence, there are no 'catalogue' or off the shelf items. It is this ethos which has ensured significant repeat business for us as a company - such as the three platinum mine flash drying plant projects we undertook with Betterect." He explains that furnaces and smelting operations require bone dry, free-

flowing concentrate for material transport and injection into furnaces. Therefore consistent, reliable, and fully automated mineral concentrate drying has become a key requirement for every smelting operation.

"DryTech International's profound knowledge and understanding of the concentrate drying process ensures that, in addition to being cost-effective, these criteria are met; and, in collaboration with Betterect's all-round expertise and specialised fabrication, the recipe for success is a given when designing and delivering bespoke flash drying plants," Horstmann notes.

With a small, tight and efficient team of 30 people, including design and process engineers, DryTech International has created a paradigm shift in the drying of mineral concentrate within the mining sector - as the flash drying process is not only exceedingly fast, affording favourable turnaround times - but also highly effective, impacting positively on production, he adds.

"To achieve all this, we share the workload with the fabricator; and, as both companies are ISO-certified and design and fabricate flash drying plants to fall within the legal emissions requirement — determined by the Department of Mineral Resources (DMR) in South Africa, and specified by whatever country we are manufacturing for — we have absolute confidence in our teamwork," he adds. Betterect fabricated all three flash drying plants in accordance with the detailed drawings supplied by DryTech International.

"The actual flash drying process happens within 30 seconds, and in minerals specifically, we aim at attaining less than one percent moisture in the concentrate. This process takes place at between 600°C and 700°C," Horstmann points out.

All platinum ore is 'wet feed' material, he explains and therefore requires intense drying — which in turn, translates into high power consumption and increased cost — to achieve this.

"However, through our many years in the industry, we have developed a highly efficient feed management method for attaining the optimum drying result, using the least power, while expediting the process. By combining already dried concentrate



with the material that requires flash drying, the dry material circulates, and the concentrate is dried faster, using less power, in a shorter time, to achieve the best result," Horstmann explains.

The flash drying plant produces 30 tons per hour of mineral concentrate, at 600°C for the heat input temperature, while the drying temperature is 110°C, which ensures it is bone-dry, free-flowing concentrate.

Horstmann emphasises that the project was completed seamlessly, from logistics and risk assessments to communications.

"In line with previous projects, this was executed on time, on budget, with precision and expertise. We once again experienced Betterect's professionalism first-hand, with minimal challenges during any process: from submitting the detailed drawings and fabrication through to installation. There were also no reported injuries, owing to stringent adherence to all health and safety protocols.

"As per the 'Team Africa' concept, when industrial suppliers collaborate synergistically, our collective experience and expertise can only benefit the industry and grow the economy," he notes.

"We look forward to working on many future projects with Betterect as our preferred fabricator and installer. Our trio of mineral concentrate drying successes are therefore definitely not a flash in the pan!" he concludes.



AN ORGANISATION'S 'KAIZEN' DETERMINES CONTINUOUS IMPROVEMENT

What is it that we are being taught through the continuing stagnation of the economy? That to survive, we need to adapt.

Adaption does not always refer to major changes, but rather small incremental adjustments required for a greater impact to take place as these minor tweaks start to take effect.

Key to this is that the whole organisation must be part of the process and striving towards common goals together.

The concept of small changes leading to major effects is not new. This approach was developed in the USA under the Training Within Industry program during World War II when there was neither time nor resources for large and innovative changes in the production of war equipment. It was again used, following the war, when American occupation forces brought in experts to help with the rebuilding of the Japanese industry.

SMALL STEPS BIG IMPROVEMENT

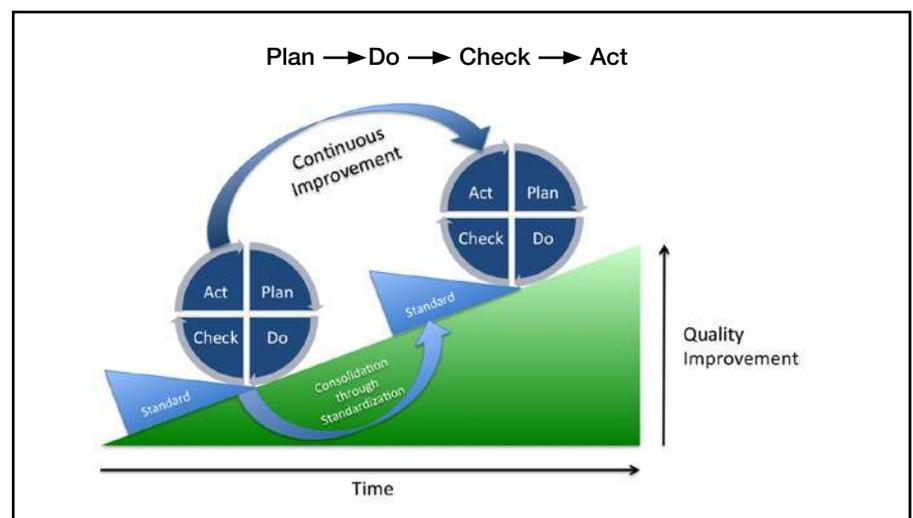
The core of this methodology is

the small-step work improvement approach. Instead of encouraging large, radical changes to achieve desired goals, these methods recommended that organisations introduce small improvements, preferably ones that could be implemented on the same day.

The essence of the approach came down to improving the use of the existing workforce and technologies. This process was later refined and made popular by Toyota and is referred to as Kaizen. The Japanese word kaizen

means “change for better”.

Lean production is founded on the idea of kaizen – or continual improvement. This philosophy implies that small, incremental changes routinely applied and sustained over a long period result in significant improvements. The kaizen strategy aims to involve workers from multiple functions and levels in the organisation in working together to address a problem or improve a process. The cycle of kaizen activity can be defined as:



Each time that the organisation improves through the Plan-Do-Check-Act cycle a new standard for performance is set and the process is repeated.

There are two types of kaizen:

1.FLOW KAIZEN

Also called system kaizen, which focuses on the overall value stream. It optimises the flow of the production system and performs waste removal activities on the overall value stream. For example, the purchase of a new forklift which optimises two or more production stations would be flow kaizen.

2. PROCESS KAIZEN

This focuses on removing waste from individual processes.

FLOWING INTO VALUE STREAMS

Flow kaizen focuses on the whole, whereas process kaizen focuses on one individual component of the assembly line. Flow kaizen is generally a management responsibility, and process kaizen is a team leader or operator responsibility.

As mentioned, kaizen is a process that should occur continuously. Management should be relentlessly focused on optimising the production process and reducing non-value-added waste.

However, there is a defined process in which kaizen activities are performed:

1. Map the value stream:

In lean manufacturing, the value stream represents the work tasks that must be performed to create the product which creates value for the business, i.e. value what the customer is willing to pay for. Once the item of value has been identified, the process to create that value is mapped.

2.Choose a process to optimise:

From the map, areas are identified that are restricting productivity. As an alternative, the entire production process in the case of flow kaizen can be selected.

3.Implement the 5 S's:

Lean manufacturing uses five S's to guide kaizen activities. These describe workplace practices conducive to visual

control and lean production:

Step 1. Sort: Tools, materials and paperwork should be separated into needed and unneeded items. The unneeded items to be discarded.

Step 2. Straighten: When workplaces are organised intuitively the production process becomes highly efficient.

Step 3. Shine: Production stations should be clean and neat promoting productivity.

Step 4. Standardise: Work should be standardised into written procedures to eliminate variation.

Step 5. Sustain: Creating the discipline to perform the first four S's part of the organisational culture.

4. Look for the 7 types of waste:

Kaizen involves relentlessly searching and removing the types of waste:

- **Overproduction:** Overproduced means the manufacturing process has been wasted. Costs are incurred to store the product, and the sales staff must work to produce discount campaigns to move it.
- **Waiting:** Anything that is waiting for something is wasting a component of the value stream.
- **Transportation:** Moving parts around unnecessarily between processing steps, between processing lines, and when product is shipped to the customer.
- **Overprocessing:** Processing a product beyond what the customer wants.
- **Excess Inventory:** When more than the minimum stocks of materials and parts are stored in preparation for assembly, this is considered waste.
- **Movement:** The unnecessary movement of people, such as operators.
- **Defective Products:** When a product is scrapped, the entire production process has been wasted. If the defective product can be moved back to a previous production step, only some of the process is wasted, but it is usually a significant part of the whole. A defective product should be a constant, rigorous application of kaizen.

5. Design process improvement:

After implementing the 5 S's and identifying the seven types of waste,

process optimisation is probably readily identifiable. Implementation of the kaizen improvements should be swift and avoid meetings and presentations, if possible.

6.Measure:

Results need to be measured and compared to the benchmark values.

7.Follow up:

This is to ensure that changes have been properly implemented and adhered to.

LEAN AND EFFECTIVE

Apart from eliminating waste in business processes, kaizen helps to improve efficiency. Kaizen creates standardised work processes, reduces cost, and boosts productivity.

Implementing kaizen gives room for employees to take on leadership roles and show their leadership skills. Other kaizen advantages include improving teamwork and including employees in decision making.

Nevertheless, kaizen has its limitations. One major kaizen disadvantage is that it distorts the entire management system and it could be difficult for businesses to go back to previous systems. Also, employees might be unwilling to change the system that they have been used to. Furthermore, training staff to adapt to new changes could be expensive and very demanding. If employees do not play their part in adopting these changes, the amount of time and resources spent will go to waste. In the end, the purpose of implementing kaizen is defeated.

Should an organisation use Kaizen or not?

Although kaizen may be difficult to implement, it is not impossible. In addition, it may be easier to implement kaizen in some organisations than in others.

For instance, a new business can implement kaizen easier than those with already established management systems. It would also be beneficial to a new business if it implements kaizen methodology from inception.

Nevertheless, when businesses have a good understanding of kaizen advantages and disadvantages, they can use them for their benefit.

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MAXIMIZING THE COST-EFFECTIVENESS OF STAINLESS STEEL

While most people will agree stainless steel renders a long-lasting solution for many corrosion applications, the perception remains that stainless steel is expensive.

This is not true, even if the kilogram price of stainless is higher than other metals. This is because the price driver in the case of stainless steel is the alloying content of the material.

Stainless steel is an alloy of mainly iron and chrome with small amounts of other elements that enhance specific properties of stainless steels. By varying the content of these elements, different grades are developed for different applications. These elements give rise to the fact that stainless steel is not just one material, but rather a family of steels, each with specific properties.

A good understanding of the role of the chemical elements in stainless steel will give a good understanding of the different grades, their strengths, and limitations.

By selecting the correct grade for the task at hand, we can limit not only

the initial costs but also the cost of maintenance and associated downtimes. Once this has been done, a cost analysis over the life span of the product will quickly indicate that stainless might be the material with a high initial cost but one which remains virtually unbeatable when it comes to total life cycle costs.

While this is advantageous, it still does not explain how to select the optimal grade of material for a specific requirement. To make the best material choices, it is also important to understand:

- The physical environment for the installation
- The functional application of the components
- Understand the nature of corrosion

PHYSICAL ENVIRONMENT

Stainless steel is one of the most durable materials used in architecture and other external applications. Evaluating the environment can be critical in making correct grade selection. As mentioned, stainless steel is not one material, but

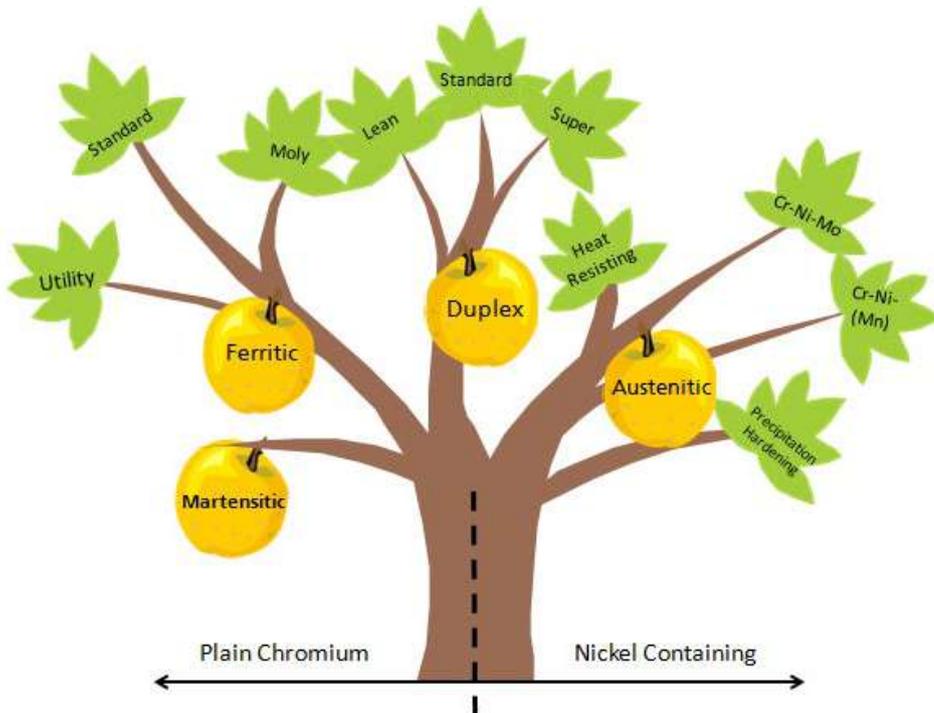
rather a family of many different types with different properties and, most importantly, different levels of corrosion resistance.

If an appropriate stainless steel surface design and finish are selected and properly maintained, its appearance will remain virtually unchanged over the lifetime of the building, even if that life is well over 100 years. Alternatively, should inappropriate stainless steel and/or finish be used, corrosion can become a problem.

Sassda relies on the evaluation solutions offered by the International Molybdenum Association (IMOA) which is determined by European Standards (EN) and is now in the process of developing a unique product solution that will be suitable for South African conditions.

The evaluation system has five sections in which the following aspects of the environment is rated through a points system:

- **Environment:** The environment is rated as rural or according to various



UNDERSTANDING CORROSION

A good understanding of the possible corrosion mechanisms that are present in the environment and the process is required to recognise the potential risks and address them in time.

The mechanisms of corrosion are complicated and usually create conditions for other mechanisms to initiate. In many cases, the visible corrosion only acts as a symptom for different root causes. Identifying the root cause for corrosion can be material, design or process-related and can only be rectified after proper investigation and analysis. Sassda supports this process with corrosion investigation and mitigation.

PREVENTION IS BETTER THAN CURE

A prior understanding of the environment, the process and corrosion parameters are required to make the best choice of material grade to deliver a cost-effective product.

It is essential to be able to evaluate failures and to learn from the experience. However, real cost efficiency cannot be achieved through failures. It is, therefore, significant to use cost-efficiency parameters during product development or the specification phase of a product or installation.

At first glance, it may look difficult to collate different combinations of initial costs, fabrication costs, maintenance, and downtime costs for different material choices when making the best economical decision in the project planning phase. However, a structured total lifecycle costing analysis can put all relevant material related costs over the entire lifespan of the project into perspective.

Sassda has developed a mobile App that calculates the total lifecycle costing for various materials. The result is provided in monetary value and gives users a complete and highly accurate analysis of material related costs.

By gaining material and corrosion knowledge and using the tools available on the Sassda platform, you can now ensure that the best economical decisions are made when selecting materials for critical applications. Simply Brilliant!

THE FUNCTIONAL APPLICATION OF DESIGN COMPONENTS

Whilst the physical environment will determine the most cost-effective grade to cope with an environmental corrosive attack, the functional nature of the application can contribute to additional risks.

It is important to understand the process parameters to determine the risk for specific forms of either dry or aqueous corrosion. Once again design considerations and procedures for use and maintenance can play a critical role in optimising the life span of stainless steel equipment. The corrosion risk analysis will include information such as:

- The presence of process-related corrodents
- Product pH value, product solution strength, as well as operating temperatures
- The presence of chlorides and chlorine
- Design, fabrication, and operational issues

Sassda offers regular training webinars and courses aimed at educating members and industry on these matters and can assist with this type of operational evaluation.

levels of industrial pollution.

- **Coastal or Marine salt exposure:** Chlorides are responsible for most environmental corrosion attacks. The level of salt exposure will be rated with a point system compiled in conjunction with the CSIR Corrosion map for South Africa.
- **Local weather pattern:** Local weather patterns determine temperatures and humidity levels which influence corrosion rates. It will also give information on rainfall which plays a role in "washing" the material.
- **Design considerations:** This includes factors such as surface roughness, finish grain orientation, sheltered or horizontal surfaces and crevices.
- **Maintenance schedule:** If stainless steel is susceptible to corrosion by salt (chlorides) or pollution, it must remain on the surface of the stainless steel long enough and in sufficient concentration for corrosion to start. Scheduled cleaning is required depending on the above factors.

These site evaluation tools are available from Sassda and the association can also assist in evaluating the corrosion potential for a specific geographic location.

PREVENTING GALLING IN STAINLESS STEEL THREADED FASTENERS



Austenitic stainless steels are widely used for corrosion resistant bolting. One of the major problems in the use of stainless fasteners is that disassembly is difficult because nuts and bolts seize. This phenomenon is known as galling and it is most prevalent with intermittently operated, slowly sliding surfaces.

Thread galling seems to be the most prevalent with fasteners made of stainless steel, aluminium, titanium, and other alloys which self-generate an oxide surface film for corrosion protection. During fastener tightening, as pressure builds between the contacting and sliding thread surfaces, protective oxides are broken, possibly wiped off, and interface metal high points shear or lock together. This cumulative clogging-shearing-locking action causes increasing adhesion. In the extreme, galling leads to seizing - the actual freezing together of the threads. If tightening is continued, the fastener can be twisted off or its threads ripped out.

Here are suggestions for dealing with the problem of thread galling when using stainless steel fasteners:

1. Slower rotational speeds:

Slowing down the installation rotational speed will frequently reduce, or sometimes solve, the problem. The heat generated during tightening increases, as the speed that the threaded bits are assembled at, increases. As the heat increases, so does the tendency for the occurrence of thread galling.

2. Lubrication:

Lubricating the internal and/or external threads can eliminate galling. The lubricants should contain substantial amounts of molybdenum disulfide, graphite, mica, or talc. Be aware of the end use of the fasteners before settling on a lubricant. Stainless steel is frequently used in food related applications, applications, which requires specific lubricants.

Lubricants can be applied at the point of assembly or pre-applied as a batch process.

3. Using different alloys:

Using different stainless alloy grades for the bolt and the nut reduces galling. The different alloys in the mating assembly will have different hardness values. If one of the components is grade 316 and the other is grade 304, the combination would be less likely to gall than if it is of the same alloy grade. This is due to the different work-harden rates between the two grades. However, it is important to ensure that the suggested grade meets their corrosion requirements of the design. In the case of 304 nuts on 316 bolts the difference between the two grades on the galvanic scale is very small. This means that the possibility of galvanic corrosion is mitigated. It is preferential to use a hardness difference of at least 50 Brinell between the nut and bolt.

4. Design and quality control:

a. Surface finish: It is interesting that highly polished surfaces ($R_a < 0.25 \mu\text{m}$) or very rough surfaces ($R_a > 1.5 \mu\text{m}$) tend to gall more. Cold rolled surfaces perform better under galling conditions since they tend to be smoother than machined surfaces. Machined threads should be carefully deburred before assembly. On the other side of the scale, significant galling problems may be experienced with electropolished surfaces which can be very smooth. However,

electropolishing smooths rough edges and for this reason is an advantage in reducing galling tendency.

b. Goodness of fit: Parts should be dimensionally tight enough to prevent vibration and wear with consequent roughness which might facilitate galling. However, sufficient clearance is required to avoid fouling during assembly.

c. Quality control: As with all stainless steel components, good housekeeping is needed to exclude dirt or abrasive materials from between mating surfaces. It is also important that the thread profile match, i.e. diameter, clearance, and thread form. Separation and traceability in storage is of key importance.

5. Control: Use a torque wrench and the correct force for the material class and surface conditions.

TORQUE AND GALLING DATA:

The table below shows torque values for several material pairs according to ASTM G98. It indicates the threshold stress where galling would start for different materials in contact with 304 grade stainless steel. Brinell hardness values are used.

METAL A (BRINELL HARDNESS)	METAL B (BRINELL HARDNESS)	THRESHOLD STRESS (MPa)
S30400 (140HB)	S30400 (Austenitic, annealed - 140HB)	13
	S31600 (Austenitic, annealed - 150HB)	13
	S43000 (Ferritic, annealed - 159HB)	165
	S41000 (Martensitic, hardened and stress relieved, 352HB)	>340
	S21800 (Nitronic 60 - Austenitic, annealed - 205HB)	>340
	Waukesha 88 (141HB) (contains Sn and Bi)	>340+

TABLE: Calculated fastening torque

DIAMETER mm (D)	PITCH mm	TORQUE - NEWTON.METRE (Nm)		
		CLASS 50	CLASS 70	CLASS 80
M3	0.5	0.4	0.9	1.2
M4	0.7	1	2	2.7
M5	0.8	2	4	5.4
M6	1.0	3	7	9
M8	1.25	8	17	22
M10	1.5	15	33	44
M12	1.75	27	57	76
M14	2.0	43	91	121
M16	2.0	65	140	187
M18	2.5	91	195	261
M20	2.5	127	273	364
M24	3.0	220	472	629
M27	3.0	318	682	909
M30	3.5	434	930	1240
M36	4.0	755	1620	2160
Elongation when tightened		0.6D	0.4D	0.3D

Tables courtesy of ASSDA



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the importance of making the correct tool choice

An interview with a Sassda member

The South African stainless steel industry has been under pressure for several years due to various reasons. Member companies needed to adapt, and the resilience of our sector is once again showing through. Most of our long-standing members have been through cycles of difficult times and have become ever watchful and therefore improved structures and systems to remain abreast of any developments; whether it is market-related or improving general efficiency. Sassda tends to look at areas for major improvements for efficiency, but our successful members will testify that these major areas for drastic improvements soon run out. The key is to continuously do small improvements at all levels of the organisation.

In the modern age of industrial innovation, it has become more important than ever to analyse the performance of every tool in the manufacturing process or the process of value addition. One of these areas for continuous improvement of efficiency

and thus reducing costs will be so-called consumables such as abrasives and general tooling. In a recent interview with Dewald Bodenstein, the commercial manager at our member company Grinding Techniques in Krugersdorp, he agreed with this view.

He further stated that the margin between success and failure, profit or loss may be determined by the small differences in production times and costs that are often taken for granted.

"It is often experienced that we do things the same way we have always done them, even though the parameters and environment we operate in have changed. Why spend four hours battling to get a job ground and ready for shipping when one hour will do? Why employ three fitters, occupy additional machines, PPE, electricity, and other associated costs when the right tool could assist one fitter to be up to three or even four times more efficient? Why wait another day to invoice a job that could have been delivered today?"

When looking at the wide range of

alloys that are being developed for all kinds of applications, it is critical to make good tooling choices to cope with the mechanical properties that can widely differ from alloy to alloy. According to Dewald, this is especially true for casted products. "Some alloys are lighter, and/or harder, more abrasion-and-impact resistant, while others tend to react better to sub-zero temperatures or prove more heat-sensitive than ever before."

He remarks that fortunately tooling technology is also keeping up with the developments in the metallurgical field. "Manufacturing methods, bonding systems and mineral types have been evolving to keep up with the demands created by new modern innovative alloy introductions. At Grinding Techniques - a Tyrolit company - we are at the cutting edge of development and able to provide a solution to abrasive requirements."

When discussing the matter of machining of the new "super alloys" with manufacturing members, it is becoming apparent that machining of these materials will be and is already a



serious challenge. According to Dewald grinding has proven to be one of, if not the preferred method, shaping some of these alloys. Abrasive manufacturers all over the world are gearing towards the grinding, shaping, and machining of exotic alloys with a far greater success rate over that of the machine tool bit manufacturers.

New innovative products being developed have brought grinding and machining times of certain components down from four to six hours per part, to less than 24 minutes per part. This is a major cost-saving as well as an increase in productivity by just making good choices.

In the stainless world of manufacturing, it is often required to shape hard alloys such as the martensitic materials, and grinding times on these hard materials can be reduced by more than 66% by using ceramic tooling. As a result of the shortened grinding times, less heat is being generated through friction, by significant proportions with a noticeable cost saving as a result. Scrap rates as a direct result of heat cracks are now something of the past.

It is important to understand that tooling is also highly specialised and not a “one size fits all” type commodity.

This is illustrated by the fact that whilst the ceramic range is effective on chrome containing and abrasion-resistant materials, it does not provide the same performance level on cast iron, sg iron, manganese, and steel foundries materials. This is because the grinding mineral offers a sharper, more aggressive grind on contact, but the bonding system employed, breaks down differently to that of conventional grinding wheels developed for softer materials. Selecting the incorrect tool therefore reduces the efficiency of the grinding tool on the application and increases the cost to a point where it is just not viable to use.

When Dewald was asked about the starting point for when choosing the most appropriate tool for the job at hand, he responded by saying that it starts by a willingness from the fabricators to challenge their organisations to achieve a more desirable result and produce a better end product, at a satisfactory cost level for the specific application.

He says; “You need to ask yourself what would you like to achieve? Faster grinding times with less of a bottleneck in your fettling bay? Lower grinding cost per component? Reduction in machine cost, or replacement cost?

Better aesthetic finishing?” He believes that all these issues can be addressed by selecting the correct abrasive type.

As mentioned at the start, it is noticeable that our members that have been weathered by difficult times have a mindset to adapt and to change with a changing environment. They make clever choices based on the principals of lean manufacturing and sustainability. This is one example where the will of management to improve and technology can work together.

Grinding Techniques - a Tyrolit company and proud Sassa member - offers a comprehensive range of abrasives geared towards achieving your required optimum result. With more than 100 years of manufacturing experience behind them, this member is more than willing to conduct trials, assist with application optimisation, and work along-side other members to tailor make solutions that attain the required results.

For more information on making good tooling choices contact Dewald at: +27 11 271 6400 | info@grindtech.com www.grindtech.com.



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