SUSTAINABLE STAINLESS

ISSF INTERNATIONAL STAINLESS STEEL FORUM

Safety and Sustainability Awards 2021

Caring for our people and our planet

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Introduction

For the 11th time, ISSF members have participated in the ISSF Safety and Sustainability Awards.
For the Safety and Sustainability Awards three winners are chosen in each category, giving them a Gold, Silver or Bronze Award. The ISSF Team strongly believes all case studies and all the work done at the member sites contribute to a safer and more sustainable stainless steel industry.

All companies supplying case studies for the safety and sustainability awards had to answer the following questions:

The Challenge

What problem were you trying to solve or what feature were you trying to develop?

Why?

Why did you decide it was necessary to address this challenge?

Needed Action

What action(s) did you take to solve the problem or undertake the development?

Action Review

Were the action(s) taken SMART? Specific, Measurable, Achievable, Realistic and Time-bound

Target Beneficiaries from the Action

Who are the people, organisations and/or communities who have benefited from the outcome of the above action? (e.g.; host company, employees, contractors, local community, regional community, customers, global community, etc.)

Horizontal Expansion Capability

Can the actions or approach taken be expanded for use elsewhere within your company and/or applied within other member companies?

Outcome

What benefits have you observed and quantified since you took the action? Please also explain the value of each of the stated benefits to employee health and well-being, job satisfaction, leading indicators (KPIs) and lagging indicators (KPIs).

We hope the case studies will give inspiration to other member companies worldwide.

The ISSF Team

4 Your Health + Sport Project

Member company ACERINOX EUROPA SAU
Category safety training

Challenge

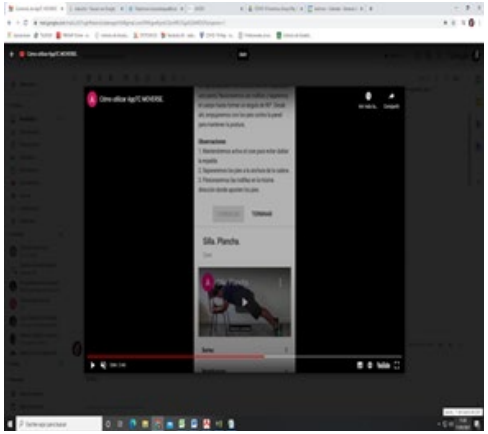
It is known by all, and the World Health Organization collects it, that musculoskeletal disorders are the main cause of disability worldwide, being highly related to a significant deterioration of mental health and functional capacities of the population in general and workers in particular; lumbar pain being the main exponent of this problem, although we cannot forget fractures, osteoarthritis and neck pain. At present this problem is also aggravated by the situation of the pandemic in which we are immersed and which makes it even more difficult to carry out adequate physical activity.

Action

For all this, Acerinox Europa together with the Pablo de Olavide University (Seville-Spain) launched a physical exercise program in 2018, which pursued the following objectives:

1. Teach the care and body protection mechanisms so that the patient-worker with musculoskeletal pain can resume normal activity more quickly and avoid new episodes.
2. Enhance the ability of the worker to care for their musculoskeletal system and self-management of painful crises.
3. Modify negative factors by learning to control symptoms.
4. Teach the worker to take an active role in the clinical evolution of the painful process.
5. Acquire correct postural habits aimed at achieving a better functional and psychological state and a healthier lifestyle for the worker.
6. Bring workers closer to the possibility of exercising in their own home, without the need to go to more crowded areas such as gyms in the current situation of the SARS-CoV-2 pandemic.

On one side, workers were offered a training plan and contributed to improving their wellness with synchronous online classes so that each worker was assigned a specific time and days a week. The application chosen to carry out the training was Skype, and once installed on the device, a link was sent to each worker as an



invitation to the session.
It was necessary to find a space at home without objects that could interfere with their movements in order to perform the exercises as safely as possible and with the right connection.
The use of footwear, sports and comfortable clothing, water, towel and mat was required.
On the other hand, workers could choose to download an application (APP TC MOVERSE) on any device and carry out personalized sessions for each one of them attending to their pathologies, at the time that was most appropriate without having to do it in a day and specific time, thus having much more freedom and facilitating adherence to the exercise program.
The group of exercises is implemented in the APP, which is integrated into a web information system that offers the possibility of managing pathologies that can be treated by the monitors, physical exercises to be carried out, as well as individualized planning and monitoring. In addition, an expert system is provided that supports the professional, recommending a series of exercises to be carried out by the worker according to the pathological profile to which they belong.
The mobile application guides the training sessions of the workers, where the beginning, end and level of development are marked, which supposes a feedback from the system for the improvement of the recommendation model in future decision making.

In both modalities, everyday utensils, such as chairs, broomsticks or water bottles, have been used to help in the sessions, replacing the usual gym equipment.

Outcome

- The number of consultations for musculoskeletal discomfort in the group of participants was reduced by 40%
- All participants in the program admitted an improvement in the feeling of wellness after the end of the sessions.
- Greater accessibility to exercise programs has been found thanks to the use of new technologies, taking into account the SARS CoV-2 global pandemic situation in which we are immersed, and which has allowed us not to have to suspend a program that reports as many benefits as this one.

Installation of Safety Guards in Pickling Area of AP Hot Lines

Member company ACERINOX EUROPA, SAU
Category workplace improvement

The Challenge

To improve the operational safety in jobs carried out in the pickling area of AP hot lines.

Why?

Because of the risks (exposure to chemicals, moving machinery and contact with hot substances) inherent in the job performance of operators and maintenance staff. Prevention Service considers this action plan to prevent incidents that may occur.

Needed action

To install innovative guard devices in the pickling area in order to ensure safety of the workers.

Action Review

Specific; The project is specific for pickling facilities.

Measurable; Because a number of elements with several potential risks. We can measure the incidents.

Achievable; The Action Plan is easy to implement.

Realistic; The aim is objective and realistic after the study and the risk assessment of AP lines.

Time-bound; Responsible staff and deadline have been defined in the Action Plan.

Target Beneficiaries from the Action

Production and maintenance operators.

Horizontal Expansion Capability

Yes, not only in AP hot lines but in AP cold lines and another pickling facilities of any steel factory.

Outcome

The objective is to avoid all possible risks for any worker using different types of protections, which must be dynamic when performing an inspection or undertaking any type of maintenance work of the production line.
The implementation allows:

- Improvement safety performance
- Risk reduction
- Accidents/Incidents reduction.

COVID-19 - Management

Member company Aperam

Category workplace improvement; accident analysis and countermeasure development; enhancement of safety management systems

The Challenge

In the beginning of 2020 the whole world was suddenly disrupted by COVID-19 (and still is!), this resulted that our normal, social way of working was not possible anymore.
The impact from this new virus was/is very heavy on health, social and economics.

- For Health, the illness rate went up, absenteeism was at it's highest
- For Social, the mental well-being was suddenly more at risk
- For Economics, there was a worldwide financial impact, that impacted production

Why?

Impact on whole worldwide organization of all companies, because of the invisible new enemy, we needed to protect our employees and also their families (Health and Mental). Therefore it was very important to shift very fast in a new way of working, this resulted in the following new challenges;

- Control the spread of the virus so our employees feel safe on the shop floor, in the offices and also at home
- Guarantee the production flow for our customers
- Control the absenteeism

Needed Action

- Fast and regular communication about the first pandemic
- Fast implementation of hygienic measures based on measures defined by the worldwide virologists and internal medical staff
- Global new Health Risk Assessments to define the new risks on the work place and defining measures
- Monitoring of the positive cases per site, to be proactive

Action Review

Specific; The COVID situation is a very specific and unique situation. This disruption has demanded that there is a complete new need to refocus Aperam.

Measurable; KPI's created to measure the positive cases per production site and to identify close contacts within the Aperam sites.

Achievable;

- Keep positives cases as low as possible
- Quick detection of COVID spreading and determine close contacts
- Shop floor visit for respecting the COVID measures

Realistic;

- Follow-up COVID measures (KPI - graphics)
- Continuous communication in line with global governmental measures
- Detection of new cases (determine close contacts, PCR testing and antigen testing on European sites...)
- Communication to contractors, to employees and their families (e.g. cartoon about COVID measures, art contest...)
- All employees received masks for them self and their family

Time-bound;
The pandemic period is considered as a Time-bound event. The end is related to several external factors (spread of the virus, vaccines and new variations).

Target Beneficiaries from the Action

By creating a pandemic working group (safety advisors, medical staff and sites managers) it was possible to reduce the COVID-19 risks for our employees and their families. This was done in a way that the deliveries to the customers were not disturbed.
We not only focussed on the employees but also on their families, this is important because it is possible to contract COVID anywhere.

Horizontal Expansion Capability

The way that Aperam had/is dealing with the virus could also apply to other companies; we are currently all facing the same special and hopefully unique situation.
Or focus was the protect employees and their families because COVID-19 does not stop at the gate of the company or at the borders.

Outcome

- Fast reaction on new COVID cases at all sites (e.g. antigen testing...), reducing absenteeism.
- No COVID break out on sites that endanger the production, therefore the production and delivery to our customers is stable.
- We not only focussed on the employees but also on their family, this is important because it is possible to contract COVID anywhere. The working group had launched awareness campaigns for the families (family art contest, COVID-19 measures in shape of cartoons, masks...) to have a frequent sensitization.

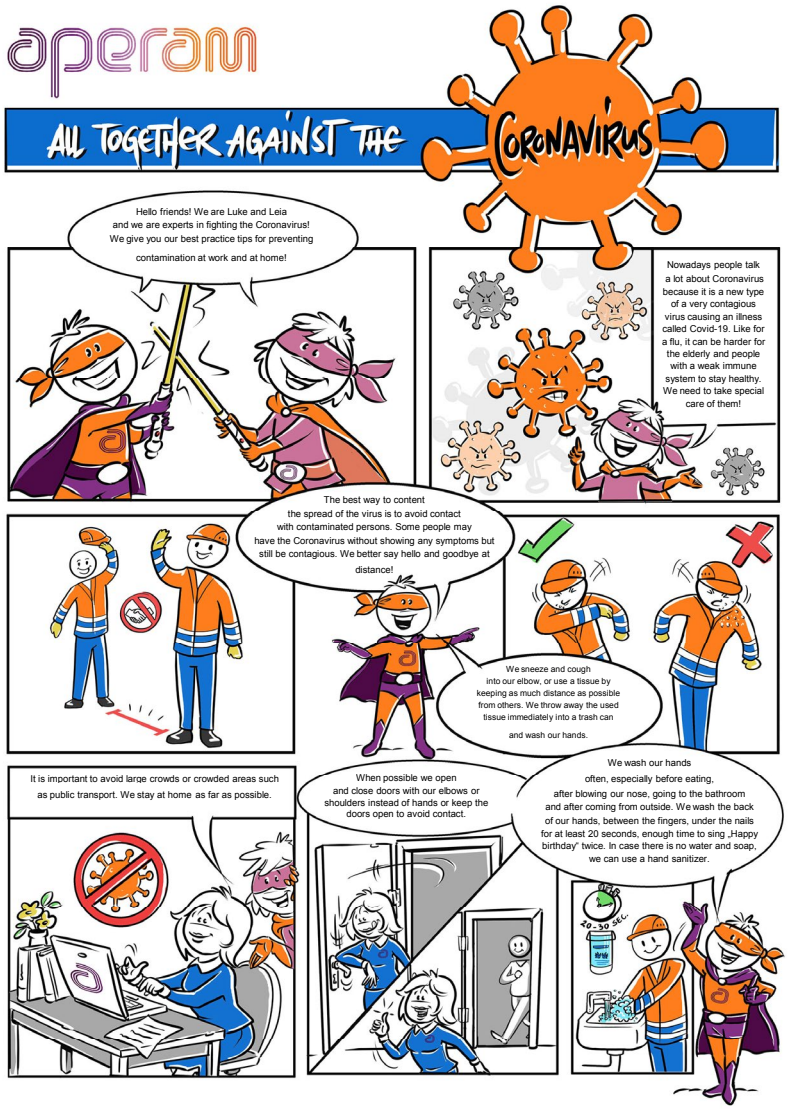
Aperam Cartoons COVID-19 rules
From the start of the pandemic in 2020 special drawings explaining the rules to apply on our sites by the truck drivers have been developed. The target was to avoid any text as we have drivers coming from a lot of different countries and not always speaking the local language.

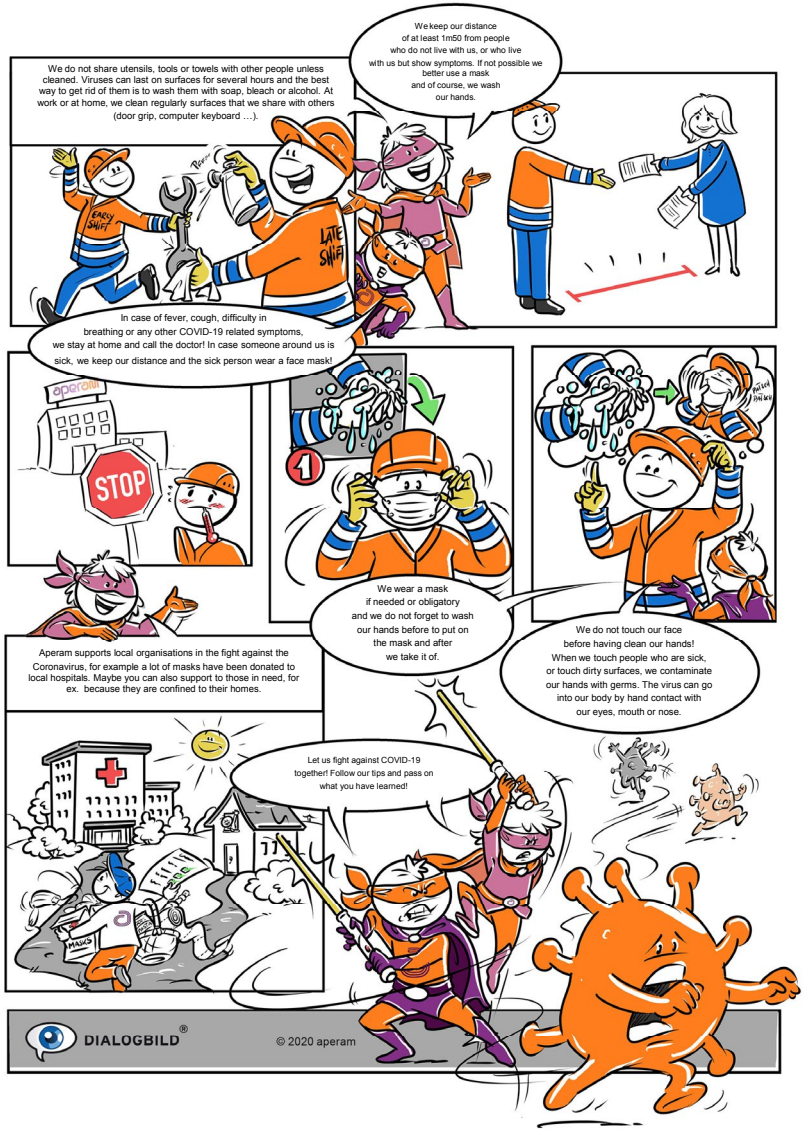
Aperam Art Contest "How we are fighting against coronavirus"

Aperam launched an Art Contest with the main aim to bring his employees and their families closer together in these difficult times of social distancing.

It was at the time where lockdown measures were started in 2020. To keep our people motivated and find an activity they could do with their children at home we launched this art contest to all our employees and their families.

Here are the 10 winners to the contest:


aperam
ALL TOGETHER AGAINST THE CORONAVIRUS
Hello friends! We are Luke and Leia and we are experts in fighting the Coronavirus! We give you our best practice tips for preventing contamination at work and at home!
Nowadays people talk a lot about Coronavirus because it is a new type of a very contagious virus causing an illness called Covid-19. Like for a flu, it can be harder for the elderly and people with a weak immune system to stay healthy. We need to take special care of them!
The best way to content the spread of the virus is to avoid contact with contaminated persons. Some people may have the Coronavirus without showing any symptoms but still be contagious. We better say hello and goodbye at distance!
We sneeze and cough into our elbow, or use a tissue by keeping as much distance as possible from others. We throw away the used tissue immediately into a trash can and wash our hands.
It is important to avoid large crowds or crowded areas such as public transport. We stay at home as far as possible.
When possible we open and close doors with our elbows or shoulders instead of hands or keep the doors open to avoid contact.
We wash our hands often, especially before eating, after blowing our nose, going to the bathroom and after coming from outside. We wash the back of our hands, between the fingers, under the nails for at least 20 seconds, enough time to sing „Happy birthday" twice. In case there is no water and soap, we can use a hand sanitizer.
20 - 30 SEC.


We do not share utensils, tools or towels with other people unless cleaned. Viruses can last on surfaces for several hours and the best way to get rid of them is to wash them with soap, bleach or alcohol. At work or at home, we clean regularly surfaces that we share with others (door grip, computer keyboard …).
We keep our distance of at least 1m50 from people who do not live with us, or who live with us but show symptoms. If not possible we better use a mask and of course, we wash our hands.
EARLY SHIFT
LATE SHIFT
In case of fever, cough, difficulty in breathing or any other COVID-19 related symptoms, we stay at home and call the doctor! In case someone around us is sick, we keep our distance and the sick person wear a face mask!
STOP
We wear a mask if needed or obligatory and we do not forget to wash our hands before to put on the mask and after we take it of.
We do not touch our face before having clean our hands! When we touch people who are sick, or touch dirty surfaces, we contaminate our hands with germs. The virus can go into our body by hand contact with our eyes, mouth or nose.
Aperam supports local organisations in the fight against the Coronavirus, for example a lot of masks have been donated to local hospitals. Maybe you can also support to those in need, for ex. because they are confined to their homes.
Let us fight against COVID-19 together! Follow our tips and pass on what you have learned!
MASKS
DIALOGBILD®
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Less Hazards Contact Timing, Less Risk

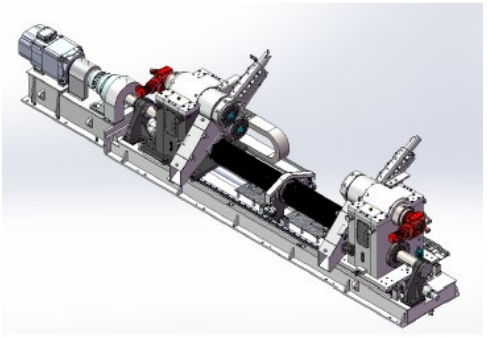
Member company Bahru Stainless Sdn. Bhd.
Category workplace improvement

The Challenge

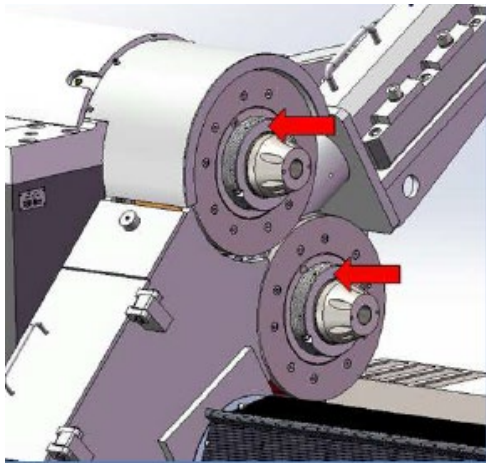
Safety concerns emerged during the process of handling the trimming scrap into the scrap winder. Sharp edges and the nature of stiffness for the stainless steel make this process become highly unsafe. The situation of handling the trimming scrap becomes even more difficult for heavy gauge material.
Manual work on guiding and moving the trimming scrap not only create ergonomics hazards, the sharp edges and the residual strength of the scrap baller also imposed cutting hazards to the scrap handler.
In addition, special care is needed for the scrap baller storage and its takes up plant floor space that could be used for production.

Why?

Manual handling of the scrap trimming is a high frequencies routine job. Cutting hazards and ergonomics hazards become one of the top safety concerns on the HIRARC evaluation.
The sharp edges can cause many injuries resulting in cuts, abrasions, infected wounds, dermatitis, amputations and occasionally fractures. Even minor incidents can result in the injured person being away from work or transferring to lighter duties.



Bahru Stainless picture 1: Scrap chopper



Bahru Stainless picture 2: Scrap chopper roating knives

Needed Action

With the new technology development, scrap choppers become the available option to improve the safety situation to handle the trimming scrap. With the scrap chopper, the scrap can be fed into the machine and direct into the cutting anvils. The scrap then can be cut into small pieces and it can be safely stored inside a bin and move to storage.

Action Review

Specific; Handling trimming scrap is one of the high frequency routine manual jobs in Cut-To-Length #1 machine. With the scrap chopper, the manual job and direct contact with scrap is able to reduce by at least 80%.

Measurable; Direct contact to handle the trimming scrap into the scrap winder need around 10 to 15 minutes depending on the gauges. With the scrap chopper, direct contact with the scrap reduced to around 6 minutes consistently for all gauges.

Achievable; Improved scrap handling has reduced the chance of injury by reduction in the direct contact timing of the manual scrap handling, reducing on-the-job injuries which reflect in the safety record.

Realistic; With the fully operation of the scrap chopper, the direct contact timing to the scrap in Cut-To-Length #1 is reduced to an average of 6 minutes.

Time-bound; Scrap chopper to be continued operation with good maintenance system of the machine and sufficient scrap chopper consumables such as chopper knife.Target Beneficiaries from the Action
Safety is a concern for any company dealing with scrap. The aim is to reduce on-the-job injuries. Poor scrap handling can lead to injury, workers' compensation claims and even litigation. Scrap handling at its point of generation via scrap choppers eliminates the hazard.
Chopping the scrap into small pieces not only helps to reduce on the job injuries, it also provide safer properties and scrap handling mechanism to the customers.

Horizontal Expansion Capability

A scrap chopper can be considered as one of the best practises for the manual handling prevention for manufacturing industry.

Outcome

- Reduce at least 80% of the direct contact timing with the trimming scrap.
- Reduce the cutting hazards
- Reduce the ergonomics hazards such as back injury when handling thick gauge trimming scrap
- Improve the storage and safety issue for scrap baller
- Improve the transportation of the scrap.
- Ease the next process. No further cut of the scrap baller.
- Increase the productivity of the machines in terms of machine setup time.

Safety Web Based E-Learning Platform

Member company Bahru Stainless Sdn. Bhd.

Category safety training and/or skills development to reduce the number of safety incidents

The Challenge

Challenges emerged once we needed to deal with CoViD-19 pandemic. Regular theoretical safety training in the classroom seems impossible in order to curb the spreading of CoViD-19 virus. BAHRU decided to establish a safety e-learning platform which provided continuous learning activities throughout this challenging period.

Why?

Continuous safety training is needed to ensure a constant momentum towards safety indoctrination is achieved even in a challenging pandemic environment.

Needed Action

Taking the advantage of existing IT infrastructure, BAHRU sees the opportunity for improvement. Training material had been uploaded in the web based platform which enable it to be accessed from anywhere at anytime by the employees. This make education is seamless. The questionnaires had been created and employee understanding on each syllabus can be gauged almost immediately after an e-learning session.
Employees could send e-mails or communicate with the trainer by phone at a later stage in case further queries arise.

No economic impact incur as all resources are currently available. Any improvement of this e-learning platform can be done internally by the system owner and BAHRU IT Department.

Action Review

Specific; To establish an e-learning platform of Safety Training Modules for BAHRU employees.

Measurable; Target 100 % participation especially from the Production and Maintenance staffs. Passing mark for each module is 95 %.

Achievable; The Safety Training modules had been established. The challenge is to promote staff participation throughout the year.

Realistic; Target is realistic in the sense of achieving the participation from employees. A higher passing mark is set to ensure employee's knowledge in safety is at acceptable higher level.

Time-bound; The progress of the training participation being monitored monthly and the end result which comprises final number of participation and scores will be published at the year end.

Target Beneficiaries from the Action

The e-learning Safety modules will benefits not only to the company but also can be extended to contractor's employees. Polytechnic and university students could utilize this platform as a guide and reference for their Safety papers.

Horizontal Expansion Capability

Basically this e-learning platform is accessible throughout the world. Once the issue in networking security has been properly addressed, the safety e-learning platform can be shared with all members.

Outcome

The e-learning platform had started on Q4, 2020. This initiative provides continuous training as well as to prevent the spread of CoViD-19 which is highly possible during normal classroom session.
The employees are protected and education can continue in the new normal.

Bahru Stainless picture: HSS E-learning homepage

Shop Floor Safety Areas

Member company Böllinghaus Steel, Lda
Category Introduction or enhancement of behavioural safety approaches

The Challenge

Safety mindset on the shop floor with the engagement of the collaborators in participate on the risk analysis and proposal for safety improvements at the workstation.

Why?

Safety mindset so that the collaborators see the need of improvement of their procedure, equipment and also behavioural in regards to safety at workstation.

Needed Action

Created a Pilot Safety Area with the plan of activities to be implemented at the designed workstation.
Starting to identify, with the collaborators, the actual on job risks/hazards and to get from them suggestions to improve safety at work.

Action Review

Specific; yes (risk level for the work station)

Measurable; yes (risk level before and after)

Achievable; yes

Realistic; yes

Time-bound; yes (activities plan)

Target Beneficiaries from the Action

Employees (and the company as a consequence of it, of course).

Horizontal Expansion Capability

With the success of the pilot project we are continuing with the project in other workstations on the shop floor.

Outcome

The positive feedback from the collaborators. Some issues were solved with the project.
Translation in a better “good mood” and “eyes open” for the risk/hazards as well for new improvement opportunities even after the project is complete at the designed workstation.
The workstation risk level decreased from 7 to 6,3 and 3 risks were eliminated.

A visualisation of the project can be found on the next page.

BEFORE

AFTER

BOLLINGHAUS STEEL

reFORCE SEMPRE A SEGURANÇA

SAFETY PILOT AREA

SECTOR: RAW MATERIAL CUT
SUPERVISOR: Alvaro Correia

ACTIVITIES	RESP.	jan/20	Feb/20	mar/20	Apr/20	May/20	jun/20	jul/20
Sector risk assessment (involving employees).	NN							
Collaborators training	CF							
DL50/2005 (report SGS): signs / pictograms	RP							
DL50/2005 (report SGS): controller identification	JG							
DL50/2005 (report SGS): placement of safety guards	JG							
Set safety path and paint the floor [green/yellow]	CF							
Define stock area for cut pieces and paint the floor [white]	AC							
Define safety path for the billets transport "car" and paint the floor [and extend the dotted line to the outside]	AC							
Paint the equipment protections	JG							
New sector risk assessment (involving employees).	NN							
5S result	Todos	89%	87%	93%	91%	84%	91%	

Planeado em curso Concluído

Departamento da Qualidade, Ambiente e Segurança

David Reis

Concluded ***03/08/2020***

Covid 19 Pandemic on Site Levels/Stages Management Model

Member company Category

Columbus Stainless workplace improvement

The Challenge

The World Health Organization (WHO) declared COVID-19 a pandemic on 11 March 2020. This virus spread rapidly throughout all industries across the world. The WHO published a comprehensive package of guidance documents for countries, covering topics related to the management of an outbreak of the disease. Columbus Senior management developed a tool in the form of a model to deal with the outbreak and to minimise the impact on the organisation at large. The tool is presented in a table format which makes it easier to understand, review and managed.

Why?

Legislation requires COVID 19 levels (number of individuals tested positive against a population of 100 000) to be managed as per prescribed guidelines. Columbus utilised the set guidelines and refined them to an internal and stricter model to manage transmissions on site during the different levels/stages.

The five-level COVID-19 alert system designed and implemented by government has been introduced to manage the gradual easing of the hard lockdown.
This risk-adjusted approach is guided by several criteria, including the level of infections and rate of transmission, the capacity of health facilities, the extent of the implementation of public health interventions and the economic and social impact of continued restrictions. Attached is an example.
Columbus Management embarked on a stricter management system to reduce or eliminate local transmission on site.

Needed Action

Columbus Management developed a COVID 19 stages model which is regularly audited according to internal positive cases. The number of active positive cases is plotted on the model and a specific outcome which dictates site wide precautionary measures is communicated and implemented until the set threshold is achieved.

Action Review

Specific; The model specifically control access to different areas as well as the allowed number of employees on site which are converted as per set parameters in the model.

Measurable; The model set clear measurable guidelines which are checked via physical audits and the access control system.

Achievable; All variables are achievable as the parameters was determined as per manufacturing requirements.

Realistic; The model is realistic and no negative impact on production requirements.

Time-bound; The model outcome is determined by the active positive cases on site.

Target Beneficiaries from the Action

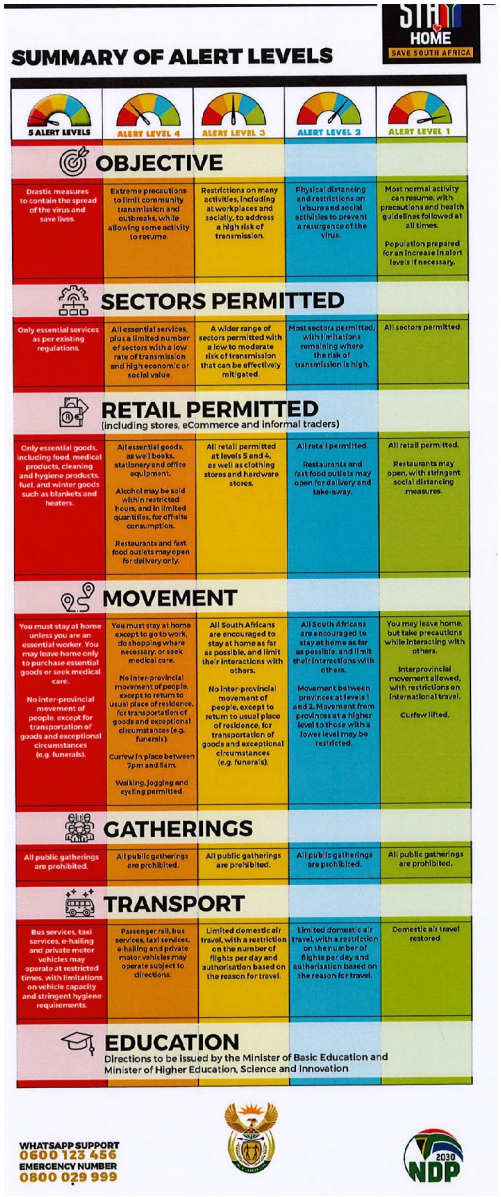
The model includes all employees as well as contractors.

Horizontal Expansion Capability

Yes, the futuristic plan is to use of the same kind of model to deal with any other communicable disease pandemics in the immediate surroundings.

Outcome

We only had two suspected on site transmission which is questionable against all the other precautionary measures that are in place.
The flexibility of the model makes it ideal to deal with the different stages /levels throughout the pandemic.
The model is customised to suite all Columbus production requirements.



Lathe Trip Wire Safety Device

Member company Columbus Stainless
Category workplace improvement

The Challenge

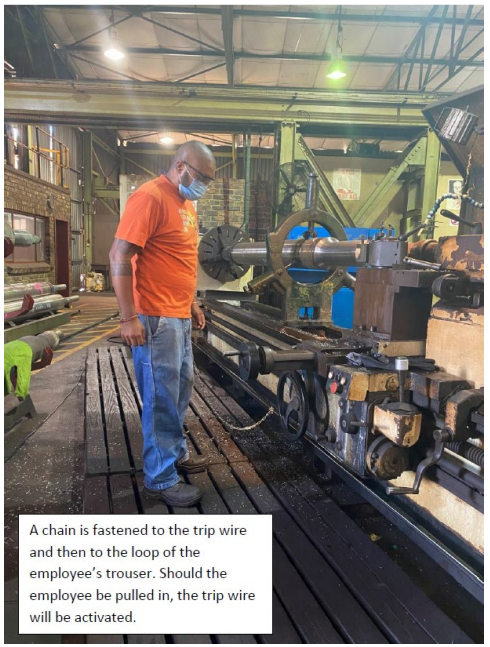
After two incidents involving rotating machinery in the machine workshop, it was decided to install a trip wire on all the lathes in order to prevent a similar incident.

Why?

The two incidents could have resulted in fatalities.

Needed Action

We needed to determine what would be the fastest way possible to stop the lathe if a person became entangled in its rotating parts. It was decided that a trip wire would suit the application best to keep the operator of the lathe safe.



Action Review

Specific: Each rotating machine will be fitted with its own unique trip wire.

Measurable: The rotating chuck of the lathe will stop within seconds if the trip wire is activated.

Achievable: It achieved all the expected results and is sufficient.

Realistic: The trip wire device does not affect the efficiency of the machine or the operator.

Time-bound: None

Target Beneficiaries from the Action

Employees and contractors.

Horizontal Expansion Capability

Yes, all similar machines in other areas of the company will be fitted with the trip wire.

Outcome

The operators are kept safer and feel safer when they machine dangerous work pieces. With this added safety benefit you have more motivated employees.

Reinforcement Lock Off Key

Member company Columbus Stainless

Category workplace improvement; introduction or enhancement of behavioural safety approaches

The Challenge

The operational interlock between the strip entry gate proxy & lock ON/OFF box during manual re-enforcement of the weld make use of similar interlock alarm as follows:

1. During re-enforcing of strip, operator need to turn log OFF key before commencing to enter on top of the strip to interlock the entry drives from moving.
2. The proxy on the entrance gate also acts as a second protection when gate is left open to interlock the entry drives from moving.

The entrance gate on open position & lock ON/OFF switch send similar interlock alarms to stop the entry from moving whilst re-enforcing of weld is performed i.e. for the same actions we used similar but different interlocks to the PLC to stop the entry. This situation caused confusion and created a condition where the protection was not rendered safe because people would use the one or the other.

Why?

The operators sometimes forget or "do-not-use" the log ON/OFF key to disengage the line during re-enforcing process. They would only relay on the gate proxy to protect them while sitting on the strip busy with welding. If the gate now closes, the "lock off" for the operator would effectively fail. The Operators still relied on the previous interlock practice prior to lock ON/OFF key being implemented i.e. leave the gate open to interlock the line
It has happen that the operator forget to turn off Lock ON/OFF key, at the same time forget to leave the entrance gate on full open position to prevent the line from crawling.
This challenge had to be taken to ensure people are safe when they perform reinforcement work on the steel strip.

Needed Action

The following engineering changes were implemented:

- Revise current alarm interlock to be linked to the castle key box i.e. remove the alarm on the gate working together with the entrance gate
- Change the castle key mechanism to enable use of "one" key between lock ON/OFF box and the strip entrance gate.
- When operator need to perform re-enforcing of the weld, the following will be followed:
  - Turn off castle key OFF and remove it from the lock ON/OFF box(only removable on lock OFF position)
  - Use the same key to open the entrance gate to access the strip (lock off key must not be removable when lock open)
  - The second key from the lock mechanism can then be removed by the operator and kept on his persons.

Action Review

Specific; Specifically intended to improve the lock out practice in a very high risk area.

Measurable; The improved action / new form of lock out eliminates the previous risk, hence reduce the amount of possible injuries on duty for the area.

Achievable; The action is fully implemented and by all means an achievable requirement for the area and its people performing reinforcement welding work.

Realistic; Yes – people feel safer with the new lock off. It also eliminated any confusion that was hanging in the air regarding the previous lock out practice – no more grey areas.

Time-bound; Effective improvement that will remain in place.

Target Beneficiaries from the Action

Columbus employees; AP2 Production personnel who works on a full time capacity as Process Controller and Section controller who undergo training. Maintenance personnel busy troubleshooting as part of their work also benefits from this improvement.

Horizontal Expansion Capability

Definitely, it can implemented anywhere especially in high risk areas.

Outcome

One of the biggest benefits of this action is the fact that employees are forced to use the protection provided. There is no way around it... this in itself eliminates the human factor where a person tires to take an impossible chance.
In general the Production employees in the area feels safe using the new lock off. It is for them peace of mind to focus on their job trusting this means of lock off will protect them/ keep the safe.
This action improves people's approach to safety because it's a repetitive action that people perform to "plan for safety" before work is commenced.

COLUMBUS STAINLESS [Pty] Ltd

MEMORANDUM

Annexure 1 of AP2 Reinforcement Lock Off Key

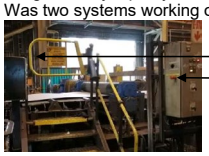
Images 1 and 2 display the implemented new lock off used at the Welder of AP2 when employees need to reinforce the joint of two steel strips. Images 3 and 4 illustrate the lock off that used to be in place before the implementation of the new arrangement / system.

Image 1: Locking device installed on the access gate – requires two keys to unlock

Image 2: Control panel is situatated away from the access gate. Operator firstly need to lock off the panel before he can open the gate.

Image 3: The Previous lock off device – the key could be used on other positions also and was therefore not always readily available.

Image 6: Only a proxy attached to the gate.m The proxy and lock off key did not interact with each other. Was two systems working on their own.



STAINLESS STEEL

TÜVRheinland CERTIFIED Management System ISO 9001:2015 ISO 14001:2015

VBA Brick Catcher

Member company Category

Columbus Stainless workplace improvement; introduction or enhancement of behavioural safety approaches

The Challenge

Falling refractories caused unexpected fires on the Vertical Bright Annealing (VBA) plant. People were exposed to fires at the felt seals. Further exposure of Nitrogen and CO2 blowing on top of them during inspection when fires occur.

Why?

Reduce the amount of fires that is ignited through falling refractories. The previous design had shortcomings that did not allow any adjustment to avoid the fires. The device failed frequently due to getting stuck.
In the past it took close to two hours to drop and establish the Hydrogen content in order to make adjustments to the brick catcher lids. There was always only a small window in which adjustments could be made safely to avoid any decrease in furnace pressure. It is very important to maintain furnace pressure to prevent exposure of employees to Nitrogen and protection of furnace.

Needed Action

Designed a new screw threaded device that allowed the operator to set the angle of the brick catcher lids manually from outside the furnace.

Action Review

Specific; Yes, the new device is focused to specifically reduce fires by giving Operators better control.

Measurable; The current design will reduce fires by at least 50% if not more.

Achievable; The improved control allows for much better governing of fires and hence improvement of safety around the VBA furnace.

Realistic; Having the means to control the lids on the brick catcher from outside the furnace is a much ore realistic approach to manage fires and associated risks.

Time-bound; This device saves time, money and physical effort.

Target Beneficiaries from the Action

Columbus Stainless; Vertical Bright Annealing Plant (VBA) employees both on the Production and Maintenance side. Emergency personnel also benefitted in a lower call out frequency to attend to VBA fires.

Horizontal Expansion Capability

This approach can be implemented in any similar patent or vertical furnace where high risks to unpredictable fires are present.

Outcome

Firstly the obvious benefit is the reduction in fires that is a very destructive force on equipment and people. There is a reduction in fire related delays and improvement in process quality. Due to the decrease of fires other manual work like changing of felt seals which is a very strenuous task with agronomical constrains were effectively reduced.

Employee exposure to nitrogen was significantly reduced. The morale of employees improved with the lower fire frequency and associated physical stress people experienced when they had to deal with the high occurrence of fires. Firstly the obvious benefit is the reduction in fires that is a very destructive force on equipment and people. There is a reduction in fire related delays and improvement in process quality. Due to the decrease of fires other manual work like changing of felt seals which is a very strenuous task with agronomical constrains were effectively reduced.

COLUMBUS STAINLESS [Pty] Ltd

MEMORANDUM

Annexure 1: VBA Brick Catcher

Images 1 and 2 display the illustrates the new design of the Brick Catcher with adjustable screw rods.

Image 1: Brick catcher lids with adjustable rods

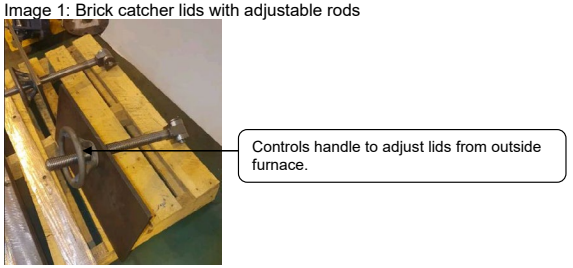
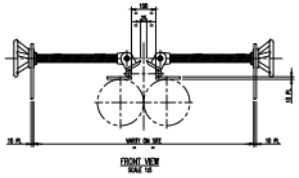


Image 2: Illistration of Brick Catcher function



Computer Based Funeral Attendance Platform (during current COVID 19 pandemic)

Member company Columbus Stainless
Category workplace improvement

The Challenge

The current COVID 19 pandemic created a situation which required employee movement to funerals which were identified as high risk and mass transmission events. This called for an internal intervention to be designed and established to authorised and tracked attendance to these events.

Why?

The challenge was to create a platform and a central input facility to track employees as and when they intended to attend a funeral especially a COVID 19 related passing. We created an electronic planform where employees could request permission form their line of management up to HR to attend funerals. This intervention would allow the organisation to conduct proper and realistic resource planning due to the following rule:

- An employee who attended a COVID 19 related funeral shall stay in quarantine for at least 10 day if showing no symptoms.
- To ensure such an employee is issued with surgical masks for 10 days.

Needed Action

Our team compiled an electronic based questionnaire as per the minimum legal legislation and make it accessible via all computers on site. The employee will complete the on line questionnaire and gained permission via an electronic system where all date are stored for future data digging and reports for the authorities when requested.

Action Review

Specific; The electronic platform was specific designed for COVID 19 funeral attendance requests.

Measurable; Reports are automatically generated and emailed to management for authorisations and then it will be automatically stored on a server.

Achievable; All employees have access to computers, either using their own work stations or Team managers recording all employees reporting to them on a daily basis.

Realistic; The electronic system is backed by a paper based system when it is inoperable of when it is offline.

Time-bound; Employees have to complete their assessment at least 24 hours before the funeral to allow the full process to take place. They will receive an email giving them the outcome a day before the date of the funeral.

Target Beneficiaries from the Action

All company employees have access to the system. The system is designed that an employee can complete the request on any computer on the site using their own company number. Contractors are currently excluded from the system as they are running their own HR processes.

Horizontal Expansion Capability

Yes, the futuristic plan is to make the request form available via an app on all mobile devices for both contractors and employees.

Outcome

We achieved great success with this electronic request for permission platform.
Employees were sent on quarantine for 10 days after the funeral to ensure they are all in good health when coming back to work.
The system also assists in the reduction of attendance of non-relative COVID 19 related funerals.
Line management could also do better resource planning.
All data are stored and backed up by the IT team.
By this system management ensured the continuous wellbeing of all employees.
The system is very effective and efficient and was developed with almost no cost.

Early Symptoms Warning of Covid 19 Disease

Member company Columbus Stainless
Category workplace improvement

The Challenge

Legislation requires all organisations to have a system in place to screen and record COVID 19 symptoms to all workers entering their premises and have such information readily available at any given time.

Why?

Failure to comply with the safety measurement could lead to a contravention under the OSHA which could result into a penalty or imprisonment.

Needed Action

Our team compiled an electronic based questionnaire as per the government gazette guidelines and make it accessible via different media platforms. Early waring messages to Senior management when employee record serious symptoms assisted the organisation to minimize local transmission at the workplace. Reports can be generated at any time when requested. Action is determined by management depending how many symptoms are recorded during the assessment process.

Action Review

Specific; The electronic platform was specific designed for Covid 19 reporting

Measurable; Reports are automatically generated and emailed to management of employees who did not complete the assessment on a specific day.

Achievable; All employees have access to computers, either using their own work stations or Team managers recording all employees reporting to them on a daily basis.

Realistic; The electronic system is backed by a paper based system when it is off line.

Time-bound; Employees have to complete their assessment within the first 10 minutes at work. Employees who have VPN access can also complete the assessment via their mobile units.

Target Beneficiaries from the Action

All company employees have access to the system. The system is designed that an employee can complete the assessment on any computer on the site using their own company number. Contractors are using the paper based system; submit the signed document to their site managers for their action if any serious symptoms are noticed on the form.

Horizontal Expansion Capability

Yes, the futuristic plan is to make the assessment available via an app on all mobile devices for both contractors and employees.

Outcome

We achieved great success with the electronic assessment.
All our Covid 19 cases were detected early and employees were directed to their medical practitioners / doctors for testing on time for treatment and for isolation purposes.
High risk employees are easily identified and required to quarantine until symptoms subside.
All data are stored and backed up by the IT team.
By this system management ensured the continuous wellbeing of all employees.
The system also indicates hot spot within the company at a very early stage.
The system is very effective and efficient and was developed with almost no cost.

Improvements of Danger Experience Education Based on Actual Disasters

Member company Nippon Steel Stainless Steel Corporation

Category Safety training and/or skills development to reduce the number of safety incidents

The Challenge

For safety education, not only teaching knowledge in the classroom, but also sensory education that allows us to actually experience the danger is effective. At the Yamaguchi Works of NIPPON STEEL Stainless Steel Corporation, in addition to the general danger experience facilities where you can experience the dangers such as getting caught in rolls, we have developed our own facility where we can analyse the actual accidents and experience them. Furthermore we also hold monthly training to experience past accidents, which is effective in improving the sense of hazard.
As an example, we will detail the facility that allows you to experience the dangers of the work roll replacement of the Sendzimir mill.

Why?

Replacing the work roll of the Sendzimir mill is an operation of manually pulling out and pushing the roll on the table roll of the roll carriage, and is frequently performed. The roll speed is low due to human power, but the inertial force is high due to the large roll weight. As a result, an accident occurred in which a finger was caught between the roll that was pulled out by oneself and the next roll (Photo 1).
The existing danger experience facility was designed mainly for accidents involving mechanical power, and it was very effective for experiencing 'the power of machine is bigger than we imagine'. However, we did not anticipate that such a serious accident could occur even when workers use their own power to move the rolls. From this accident, it seemed that there was a limit to the education of sensitivity to danger only with the conventional danger experience facilities. Therefore, education was examined that is to discover the lacking sensitivities to the dangers and to strengthen them by experience through not only general accidents but also the accidents that actually occurred at the Works.

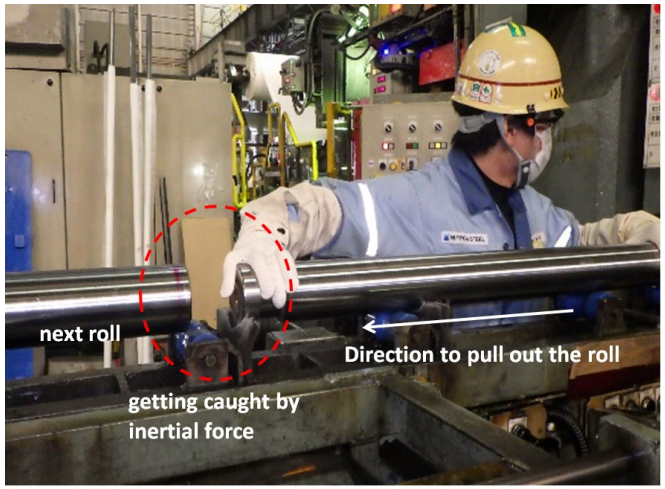


Photo 1 Roll replacement operation for Sendzimir mill

Needed Action

From this point of view, we developed our own facility to enhance the sensitivity of inertial force during manual roll replacement and introduced it to the Danger Experience Training Center (Photo 2).
As with the actual roll replacement, heavy objects can be manually moved on the table roll, and the inertial force can be felt by breaking the steel can.The trainees were surprised that the cans were easily crushed even at a small manual speed,

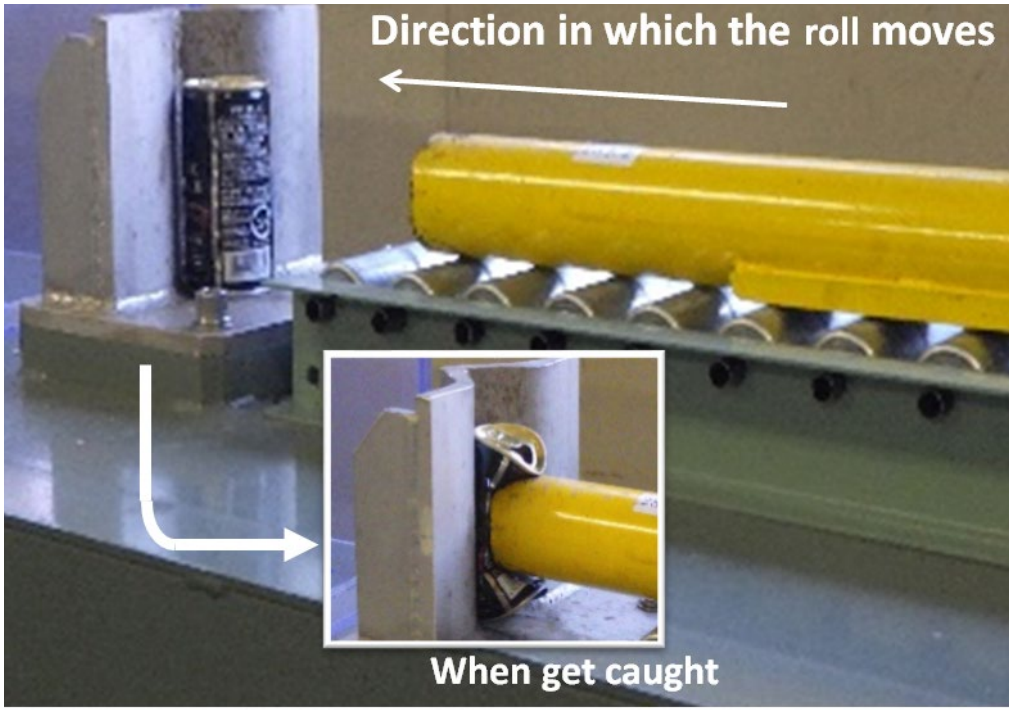


Photo 2 Inertial force experience facility when replacing rolls
(Experience of inertial force using a steel can)

and were able to improve their sensitivity to this work (Photo 2). In addition, information on the accidents analysed is posted near the device to introduce the seriousness of this inertial force.

Action Review

Specific; Trainees can easily understand the danger because the facility is designed by analyzing the accidents that actually occurred and can intuitively simulate the danger.

Measurable; We worked with the goal of zero accidents when replacing rolls.

Achievable; By performing in conjunction with a change of the roll replacement procedure, it considered achievable.

Realistic; Through this activity, the operator's sensibility was improved by being able to experience the large inertial force of heavy objects even at low speeds manually. As a result, not only was the risk prediction activity activated, but it also led to a change in the working procedure.

Time-bound; Danger experience education for all trainees has been completed as planned, and since then, zero accidents have been continued when changing rolls.

Target Beneficiaries from the Action

At the Yamaguchi Works, there are five Sendzimir mills that we change their rolls manually. Furthermore, since there are various operations of moving heavy objects at low speed such as sampling or handling paper rolls, this danger experience training is meaningful for almost all operations at the Works including subcontractors.

Horizontal Expansion Capability

Since the Sendzimir rolling mill is a standard facility in stainless rolling mills and manual roll replacement is common, there are many such operations inside and outside the company, and it is considered possible to deploy horizontally.
Also, by expanding the scope to operation that moves heavy objects at low

Panoramic view of experience training

Experience of suspended load height and necessary avoidance distance

Experience of the inertial force of a large bobbin

Experience of protective clothing when operating the disconnector for high-voltage work

Experience of the sparks at height place working

Experience of the instability of the crane suspended load

Photo 3: monthly hands-on programs to experience accidents

speed, it can be deployed in almost all workplaces.

Outcome

After the completion of the facility, danger experience training has been conducted for all staffs and no accidents have occurred during roll replacement. In particular, by making this training annual mandatory program for new employees, accidents at a young age can be prevented. By analysing past accidents in the same way, a facility for experiencing cuts with edge of the strip was added.

Currently, the Yamaguchi Works' Danger Experience Center has five danger experience facilities and a danger experience room that utilizes VR, which is being used to educate new employees and mid-career employees. In addition to the facilities, we also hold monthly hands-on programs to experience accidents that have occurred in the past, which helps to improve the sensitivity of danger (Photo 3).

Improvement for the Vibration Mill

Member company
Nippon Yakin Kogyo Co. Ltd.

Category
workplace improvement

The Challenge

A female operator has been assigned to the inspection team.
However, some operations were dangerous for female operators as follow;

1. The posture when fixing the Vibration mill's nut and bolt was bad, because it was lower than the hip. (picture 1)
2. There is a risk of wrist sprain, because the handle for nut and bolt was too short (10 cm). (picture 2)

Annotation; Vibration mill is equipment for samples such as slug. Samples are enclosed in a drum type container, and it is smashed by vibration.

Why?

To create a safety work place for both male and female operators.

Needed Action

We improved it so that female operators can work safely.

1. Put in new T-shaped wrench, it is 10 times the length of the old one. (picture 3,4)
2. Made T-shaped wrench's handle longer to 25 cm. (picture 5)
3. Set multiple nuts to raise the position of the nut and bolt. (picture 3)

Action Review

Operators can understand and execute the changes, because we have modified operational procedure.
The outcome was evaluated numerically in the Risk assessment points.

Target Beneficiaries from the Action

Operators who use the Vibration mill, especially for female operators.

Horizontal Expansion Capability

We will continue to improve our facilities to reduce safety risks for both male and female operators, because the number of woman employees has been increasing year by year.

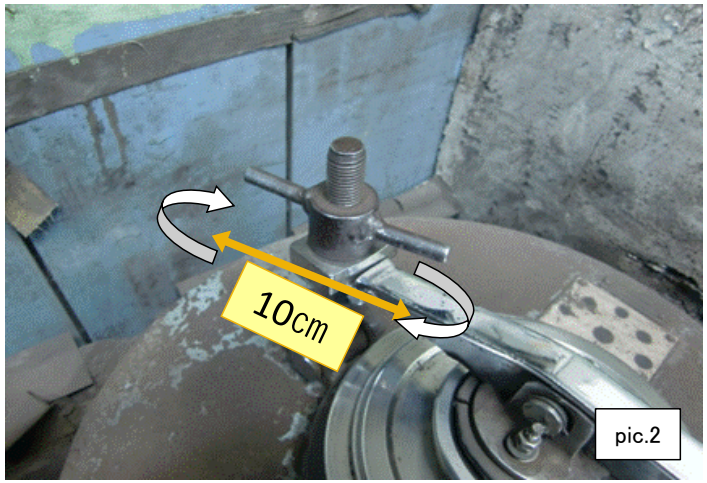
Outcome

Safety risks have been reduced for this operation. (risk assessment score, before:10points→after:3points)

1. The posture when fixing the Vibration mill's nut and bolt has become better, because it was raised higher than the hip.
2. It has become easier to screw the nut and bolt by using the long handle T-shaped wrench.

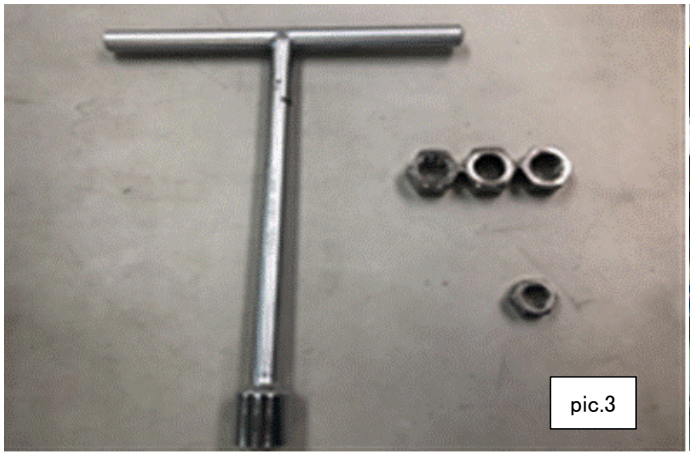
Note: pictures are available on the following page

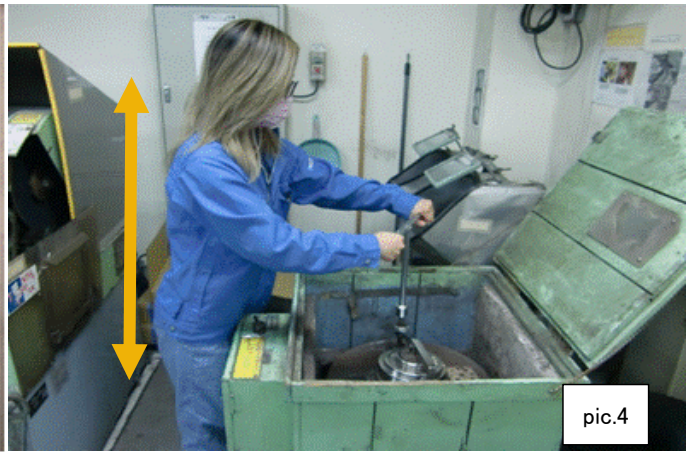

pic.1

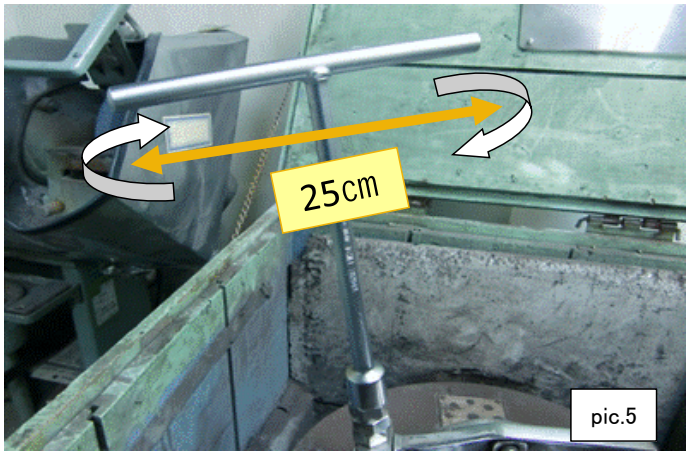


pic.2

new T-shaped wrench


pic.3


pic.4



pic.5

Elimination of Dropped Coils

Member company North American Stainless
Category workplace improvement

The Challenge

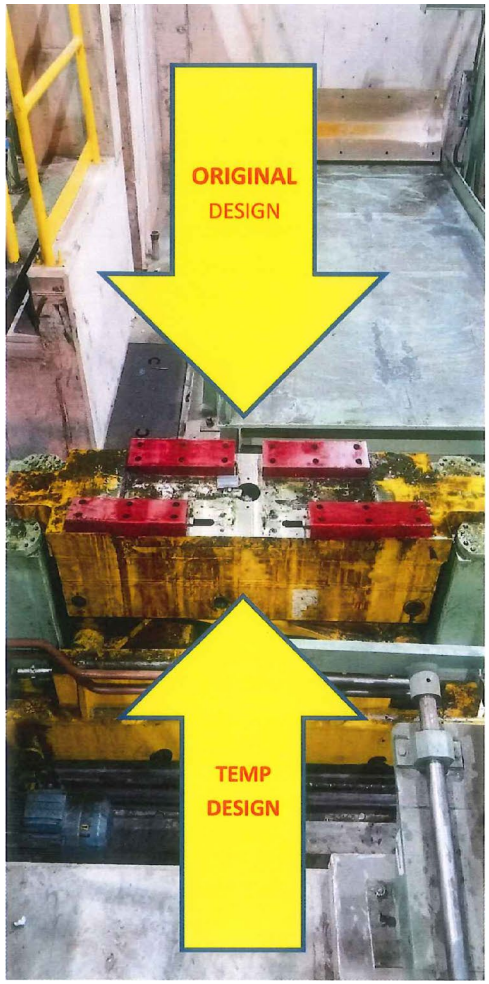
Since the inception of our AP3 line, the coil car had been dropping full size coils. The pads on the coil car were small and too close together. This wouldn't allow enough contact to a full size coil to stabilize the coil when the coil transfer car moved. When the coil would fall off, it would send the coil car back into coils that were waiting to be loaded on the line. This would cause property damage not only to the coil that fell off the coil transfer car but also to coils that were staged for the line and the coil car itself. It also posed a risk to employees. Also, when the coil would fall it could cause bands to break and the coil to expand which was also a danger to employees.

Why?

An Operator on the line spoke with one of our Engineers about the issue they had been having and the placement of the pads. He had observed the way the coil sat on the coil transfer car and realized that they there wasn't a lot of contact on the coil and felt that might be why the full size coils were falling off the coil car.

Needed Action

The Operator worked with the line Engineer to develop larger pads for the coil car. They designed a set to use as a trial to see if the larger pads would work on the full size coils. After conducting the trial they made some changes to the type of material, size of the pads and placement on the coil car. They had new pads made and once those were put in place, the full size coils didn't shift at all on the coil car. Since the change has been made, there have been no additional coils fall off the coil car.



NAS Picture 1: original placement of the pads and the temporary change made until the new pads were made bigger and came in

Action Review

Specific; - Yes. Addressed the issue with the size of the pads on the coil car.

Measurable; Yes. Once the new pads were put in place, the issue with coils falling off the coil car was resolved.

Achievable; Yes. We've had no additional issues since the change.

Realistic; Yes. The cost and to design and replace the pads was very reasonable.

Time-bound; Yes. The time it took to design and replace the pads was very reasonable.

Target Beneficiaries from the Action

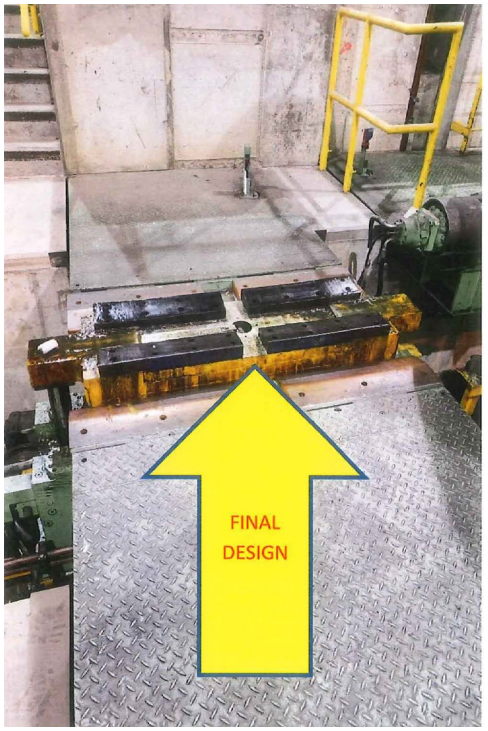
Our Annealing & Pickling Line #3 (AP3) employees as well as NAS.

Horizontal Expansion Capability

Yes. We actually reviewed all of our AP lines to see if the resolution on AP3 was needed on any of our other lines with coil cars. The other lines had a different set-up so there wasn't a need to implement this solution.

Outcome

This project was the result of one of our employees. They came up with the solution to an issue we had been having on our AP3 coil car. Since the implementation of this project, we've not had any coils drop off the coil car. Not only did this eliminate property damage to coils, it also eliminated the risk of any injury to employees or any further damage to the line or the coil car.



NAS Picture 2: the new pads in black

NAS Picture 3: in this picture you can see that the coil has slid off onto the floor and shot the coil car back into the coils on the saddles causing damage to these coils as well

Safety Root Cause Analysis

Member company Category North American Stainless accident analysis and countermeasure development

The Challenge

We were conducting investigations into all of our recordable and lost time injuries yet we still had similar injuries occurring around the facility. We couldn't figure out what we were missing during our investigations that continued to allow the injuries to happen. We needed to find a way to get to the ultimate cause of the injury and put a plan together to stop similar injuries around the facility.

Why?

Our main goal is to get to zero incidents at our facility. In order to obtain that goal, we needed to determine the cause of every incident and put a plan of action in place to address any similar incidents around the plant. That is the only way we are ever going to achieve our ultimate goal of zero incidents. We also needed to conduct investigations into no only recordable and lost time injuries but near misses and property damages also.

Needed Action

After reviewing several incident investigations we made the determination we weren't getting to the root cause. We were identifying symptoms and contributing factors but we weren't getting to the root cause of the injury. We then decided to adopt the 5Y/Fishbone process of root cause analysis into every one of our incidents. We also increase our root cause analysis team to include the employee that was involved in the incident to get ideas and suggestions on how to improve the process and stop the incident from occurring again.

By utilizing this process we have been able to dig down to the root of the issue. Our incident investigations are much more thorough and we aren't just address symptoms any longer. We are also implementing any corrective actions found across the entire facility to ensure we stop any additional incidents from occurring.

Since implementing this process, we were able to lower our total recordable rate from 2.25 in 2019 to 1.20 in 2020.

Action Review

Specific; - Yes. We needed to find a way to get to the root cause of all incidents.

Measurable; Yes. We lowered our total recordable rate from 2.25 in 2019 to 1.20 in 2020.

Achievable; Yes. We continue to see success in each investigation we perform.

Realistic; Yes.

Time-bound; Yes. The investigations take longer to perform but they are much more thorough.

Target Beneficiaries from the Action

Our entire facility has benefited from this process. We share Safety Alerts with all employees as well as other facilities and share the processes we've put in place to help eliminate incidents.

Horizontal Expansion Capability

Yes. We utilize this process for all Safety incidents throughout our entire facility.

Outcome

By utilizing a more formal root cause analysis process we are able to determine the cause of incidents and develop corrective actions to eliminate them from occurring in other locations of the facility. We are no longer just addressing symptoms but actually determining the root cause. With this process in place our goal is to reach zero incidents within the next few years.

One Team Integrated Safety Management System

Member company POSCO
Category enhancement of safety management systems

The Challenge

Occupation Safety and Health Acts is revised on account of recently frequent incidence of death of employees in domestic subcontractor so both contractor and sub-contractor must take the same level of responsibilities when accidents occur and legal liability is also reinforced. Also, public opinion on social responsibility for contractor is being emphasized.

Why?

When repair, construction and others which are being performed in steelworks, the renovation implemented for prevention for safety accidents of employees in subcontractor by deciding role and responsibility for operational work in regard to cooperative relationship and building up safety system that comprehensively manages on the site.

Needed Action

One Team Integrated Safety Management System was established to solve the above problems. This system is applied to all repair job and investment business at steelworks.
First step is that exclusive safety management is implemented with high-level of experts in subcontractor which are named as 'Red Helmet' under plant managers' supervision and identify employees' unsafe acts and improve them.
Second step is that safety manager is appointed and arranged from the person in charge of unit of facilities.
Third step is that plant manager and safety part manager intensively care for safety audit and high risk jobs and triple safety management is established and performed.
For specific performance, 'Check Sheet' is operated and all steps are recorded and all job process are being monitored by establishment of plan for application of fixed, movable and portable CCTV for job characters before start of job. Also, in place of CCTV, banners are installed and stickers which include the contents of "CCTV is recording." are attached on documents for permission for safe job so all employees are cautious for prevention for unsafe acts. Furthermore, all visitors are checked their temperature and health condition and prevented for safe accidents for personal causes.

Action Review

Specific; Three steps of safe organizational system is operated for systematic management of all process of on-site repair job by deciding role of construct and sub-construct definitely. First, safety manager in subcontractor performs safety management for the job of corporation. Second, the person in charge is arranged as one to one. Third, plant manager and safety part manager perform patrol and manage all process.

Measurable; In all job places, movable and portable CCTV is actively used and eliminate vulnerable places and perform the dimensional safety management and operate "Check Sheet" and made management of sub-construct, contract work, cooperative work and others intuitionally and easily.

Achievable; Three steps of "Check Sheet" made eliminate vulnerable places and ability to manage safety by all employees' participation.

Realistic; Safety management which be helpful realistically is performed such as an arrangement of the most well-known safety manager and others and integrated safety consultative group is operated besides simple check for process of repair. Therefore, from job of “D-1” through pre-inspection for job, identification and sharing of safety risk. Also, the day's job is shared and realistic safety management is operated for example, instant penalty for risky acts.

Time-bound; Though pre-inspection for ‘D-1’ for performance of the system, safety risk identification for job and establishment of methods and job is being monitored consistently.

Target Beneficiaries from the Action

It is effective for all employees' protection and prevention for unsafe conducts at repair and construction for investment. Also it is useful for identification of risk for service and establishment of countermeasure.

Horizontal Expansion Capability

One Team Integrated Safety Management System can be applicable to the any companies and industries.

Outcome

One Team Integrated Safety Management System became operative from November 2020 through process of preparation and Industrial accident does not have been occurred until now.

ACERINOX EAFs: Improving the Efficiency in Graphite Electrodes

Member company Acerinox Europa S.A.U.

Category emissions reduction; energy intensity reduction; material efficiency improvement; investment in new processes and products in order to deliver a defined sustainability benefit

The Challenge

The reduction of CO_2 emissions is one of the main targets in Acerinox. Because of this reason, Acerinox tried to improve the efficiency in electrodes used in EAFs (Electric Arc Furnaces). In this way, the less electrodes consumption, the less CO_2 emissions and the more energy and economical savings.

Why?

Acerinox strongly believes that the implementation of sustainable measures is the best way to achieve its purposes. The search of CO_2 reductions is directly linked with material improvements, energy efficiency and economical savings.

Needed action

It is proven that the electrodes consumption depends on the oxidation of the surface in EAFs. In this way, the Melt Shop decided to evaluate the results of coating the top of the electrodes with an antioxidant material capable of withstanding high temperatures. This material was impregnated in the microperforations that the electrodes have on the surface, which does not cause an increase in the diameter of the electrodes.
The Melt Shop compared the behaviour of standard electrodes (without treatment) and treated / impregnated electrodes. After testing both types, the obtained regression allowed us to extrapolate the data and obtain comparable results.

Action review

Specific; Acerinox decided to implement this action because it was known that the 50 % of the electrodes consumption depends on the oxidation experimented in the surface when they supported really high temperatures in EAFs.

Measurable; Acerinox´s tests (electrodes with/without impregnation treatment) collected data with which obtained comparable results.

Achievable; The Melt Shop contacted with specialists in the sector in order to find the right impregnation material capable of resist high temperatures and guarantee the increase of the electrodes useful life.

Realistic; Acerinox considered both, the target of the project and its implementation; realistic measures with which achieve sustainable benefits.

Time-bound; Acerinox decided to start this project testing one of the electrode

types used in EAFs. Several tests determined the effectiveness of this idea. However, the Melt Shop plans to continue investigating this theme with the aim of applying this technique to other kinds of electrodes.

Target Beneficiaries from the Action

Thanks to the good teamwork between the Melt Shop and the Environment Section, the host company (Acerinox Europa SAU) has benefited from the mentioned action.

Horizontal Expansion Capability

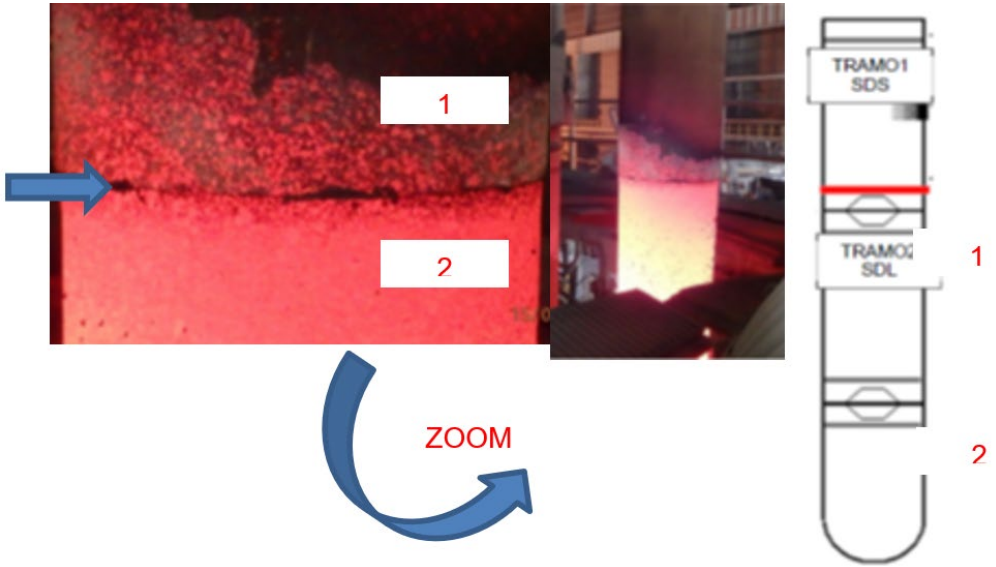
Acerinox is convinced that this project could be applied in member companies in order to reduce CO_2 emissions (and energy and economical savings).

Outcome

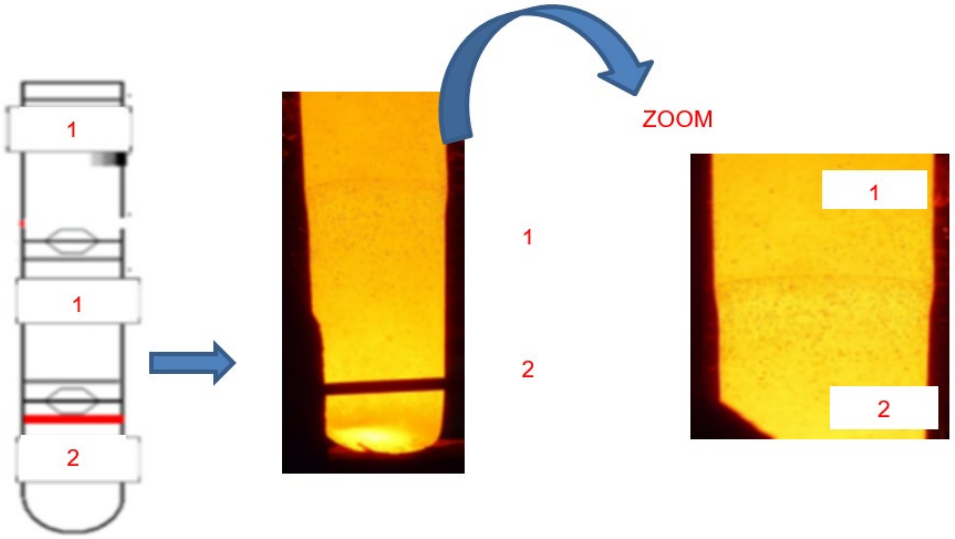
Acerinox achieved a reduction of electrode consumption of 10 %.

This result was obtained after several tests considering the same production conditions but modifying the type of electrodes - standard electrodes (without treatment) vs. impregnated electrodes.
This consumption reduction implies a decrease in CO_2 direct emissions. Taking as reference the CO_2 emissions associated with electrodes consumption, Acerinox achieves to reduce about 650-670 tonnes of CO_2e emissions per year. Even, as it was said, this CO_2 emission reduction is linked with energy and economical savings.

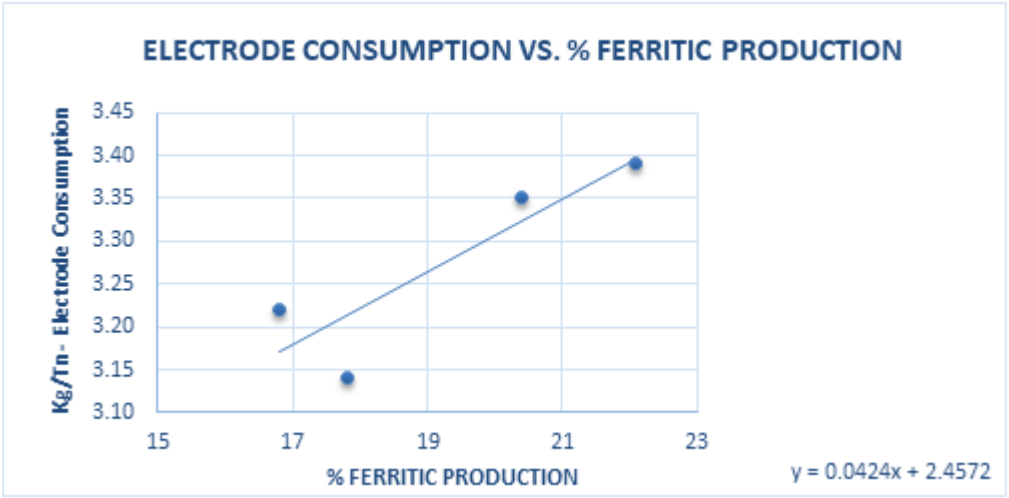
In the following pictures (two different tests), the difference between a treated electrode (1) and a standard electrode (2) – Less electrode consumption in treated electrodes.



Acerinox Picture 1: test with a treated electrode



Acerinox Picture 2: test with a standard electrode



Acerinox graph: electrode consumption vs. percentage of ferritic production

From Acid Pickling Sludge to Clay Brick

Member company Category

Bahru Stainless SDN BHD protection of scarce resources; investment in new processes and products in order to deliver a defined sustainability benefit

The Challenge

In Malaysia, acid pickling sludge from an acid neutralization plant is considered hazardous. The most common way of handling this sludge in Malaysia is disposal by landfill. This filling up fast the landfill capacity and involve a high waste disposal cost to the industry. In 2018-2019, an average 5300 tons per annum of the acid pickling sludge is sent to the approved secured landfill site for final disposal.

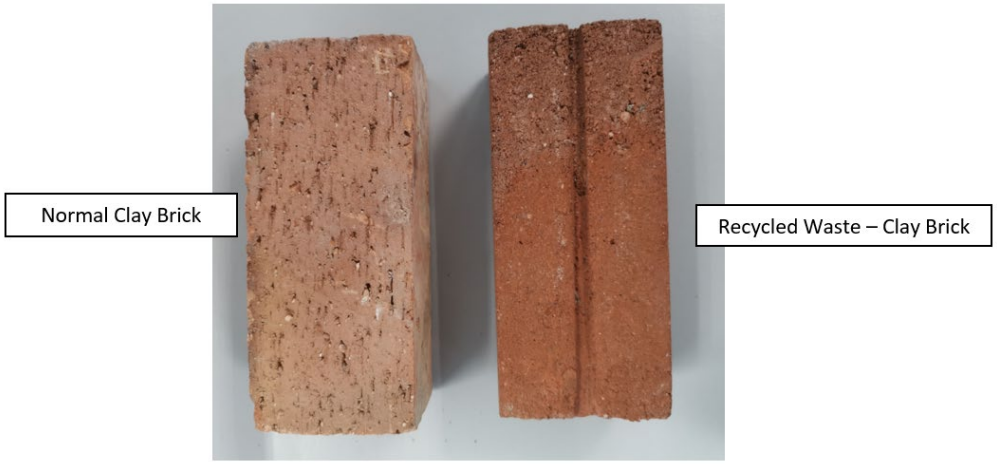
Why?

For environmental improvement, an economic method to treat and efficiently convert this sludge to a value added product is required. Recycling wastes by incorporating them into building materials is a practical solution for eliminating landfill loading up and reducing the land pollution issue.

Needed action

BAHRU STAINLESS has engaged in the research collaboration between a local University and a waste recycler for the sludge recovery project. The waste pickling sludge is used as the sand replacement in the clay brick manufacturing process.

The recycled clay brick is a 100% recycled product comprise with 70% of waste includes pickling sludge from the stainless steel industry (Bahru Stainless), clay sludge from the ceramic industry, coal bottom ash from a power plant, and the balance of 30% is recycled cement.
The conversion of acid pickling sludge into clay bricks enables hazardous waste to be recycled in a sustainable and 'green' manner on an industrial scale. The sludge-to-brick process does not use the conventional kiln operation, its 100% mechanical process, no energy and chemical consumption, This Sludge-to-Brick project fulfills the "Green" Innovation with zero waste generation achievable.



Bahru Stainless picture 1: Recycled Clay Brick versus Common Clay Brick
Through the research work done it shows that the pickling sludge can be used to replace sand by up to 30% and achieved compressive strength more than 25 MPa at 7 days. The recycled clay brick product meets the national requirements and is certified to the national building materials standard under Specification for Masonry Units - Aggregate Concrete Masonry Units requirements.

Action Review

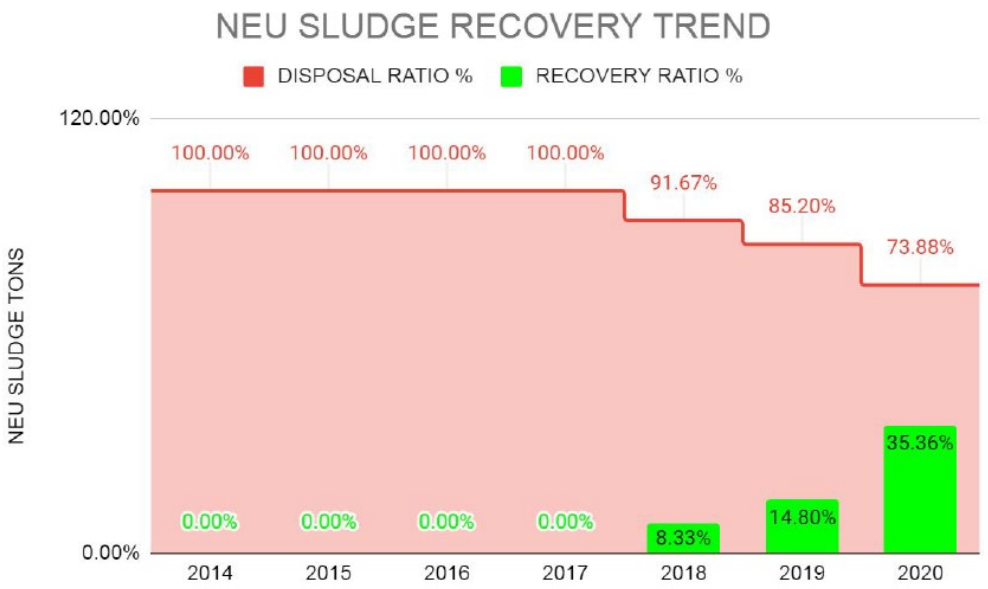
Specific; The pickling sludge is major constituent of 55% the total hazardous waste generation, where it's been sending for landfill at 100% from 2013 to 2017. Since 2018, various trials on the sludge recovery had been carried out but cannot be considered as long term project due to limitation of technology and process specification. In 2020, BAHRU managed to work with a local university and industry partner to realise the potential long term recovery project within 2021-2025.

Measurable; BAHRU was able to increase the recovery rate from 14.8% (2019) to 35% (2020) within the 6 months project period. In addition, the waste handling cost was reduced by 40% per ton of sludge sent for recovery. From August to December 2020, the total BAHRU waste recovery rate achieved 99-100% with the execution of the sludge recovery project. (Graph 1)

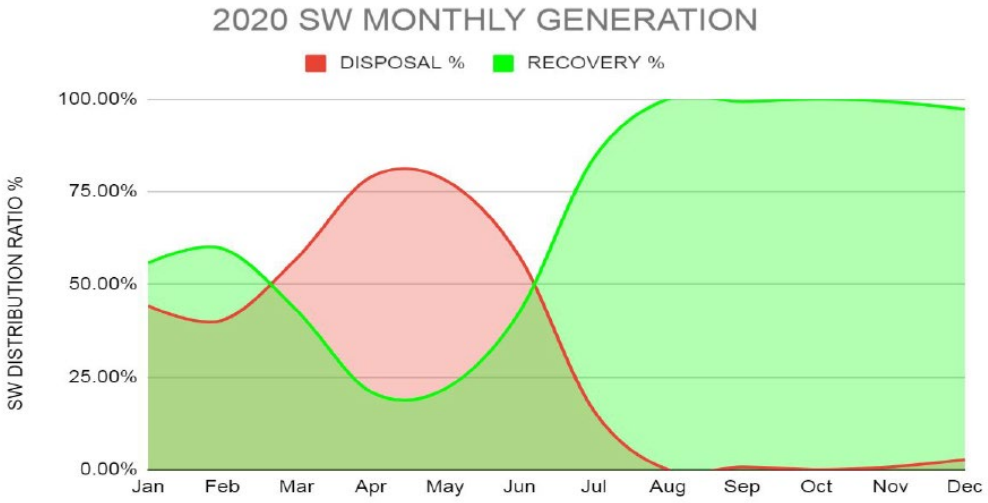
Achievable; The sludge recovery rate is forecast and able to achieve 100% in 2021-2025 with the guarantee of the recovery permit granted by the environmental authority for the sludge recovery to clay brick project.

Realistic; From August to December 2020, the total BAHRU waste recovery rate achieved 99-100% with the execution of the sludge recovery project. (Graph 2)

Time-bound; The clay brick recovery project initiated from mid-July to December 2020. The project continuance with approval was granted for 5 years (2021-2025) by the local environmental authority.



Bahru Stainless graph 1: annual sludge recovery rate versus landfill rate



Bahru Stainless graph 2: 2020 revolution of the total hazardous waste recovery and landfill rate

Target Beneficiaries from the Action

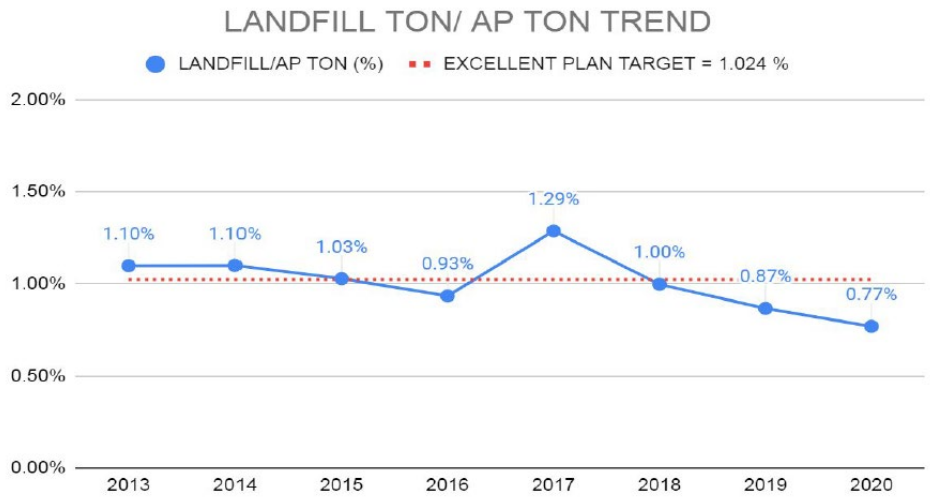
Recycling waste into building material has a direct environmental impact. A new path for resource utilization of the waste pickling sludge is provided, remarkable energy-saving and emission-reduction can be achieved, and the requirements of circular economy and low-carbon economy are met.
Diminishing mineral resources (cement and sand) will be spared for longer term. The open quarry extraction of natural construction material will be reduced and it contributes to the air pollution reduction. Ultimately, landfills will be conserved.

Horizontal Expansion Capability

BAHRU had shared this available sludge recovery into clay brick project with the Acerinox Group companies and this can provide opportunity for the other companies to further study and made reference as the potential recovery projects in the other regions.

Outcome

The annual KPI for the landfill reduction initiatives by Acerinox Group is set.
It is measured at the percentage of sludge landfill ton/ Annealing Ton.
BAHRU having sludge generation at 10.5 kg/Annealing Ton, remarked the highest landfill Ton/Annealing Ton of 1.29 % on 2017 (100 % landfill) and reduce to 0.77 % in 2020 (35 % landfill). (Graph 3)
In term of cost savings, the sludge-to-brick recovery project manages to reduce 40 % of waste management cost per ton of sludge.



Bahru Stainless graph 3: KPI for landfill reduction initiative and result

Recycled Clay Brick Properties	Recycled Clay Brick Advantages
Shape: Uniform, free from warp-age	Environmental friendly
Surface Finish: Smooth	Support green building concept
Strength : 18-22 Mpa	Less usage of mortar and saving in manpower
Water Absorption: 5-10%	Dimension Accuracy
Sound Insulation: Better than red brick	Fire resistant and sound insulation
Efflorescence: Nil	Less penetration of water in brick work
Bonding with mortar: Good High compressive strength	High compressive strength

Estimated Economic Benefit to BAHRU STAINLESS		
For Every 100 ton of Sludge generated	Landfill cost	Recovery cost
	USD 13,888	USD 8,333
	40% Reduction in Waste Management Cost	

Green House Gas Reduction by Waste Heat Boiler Optimization

Member company Category

Bahru Stainless SDN BHD
emissions reduction;
energy intensity reduction

The Challenge

Bahru Stainless uses natural gas for furnace and boiler operation. The flue gas from the furnace have been utilized to generate steam but at a minimum level. By optimizing the flue gas, it also can reduce the CO_2 emissions and natural gas consumption.

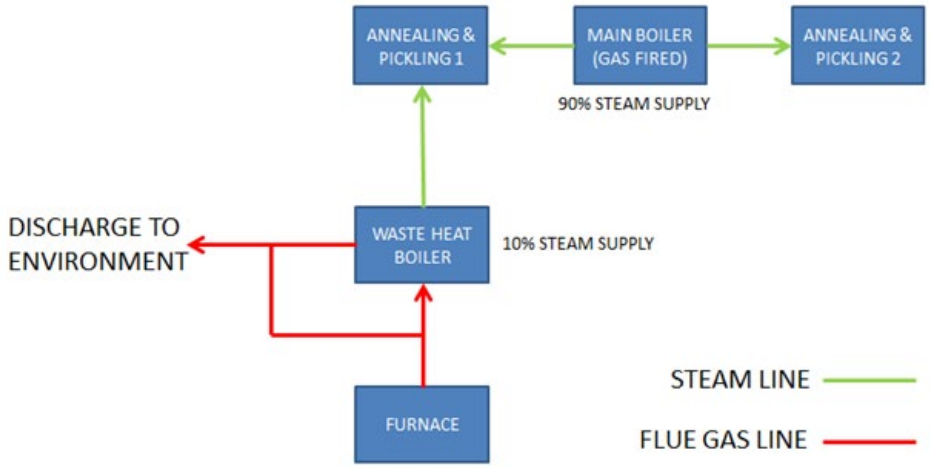
Why?

On average the natural gas consumption for boiler is 6,661 MMBtu per month and the CO_2 emission is 300 Ton/month. The high natural gas consumption will increase the greenhouse gas emission value and the operation cost.

Duration	Average Boiler Gas Sm3/month	Equivalent CO2 Ton/month	Scope 1 Intensity
2019 Jan - Oct (baseline)	158,648	300	0.17

Needed Action

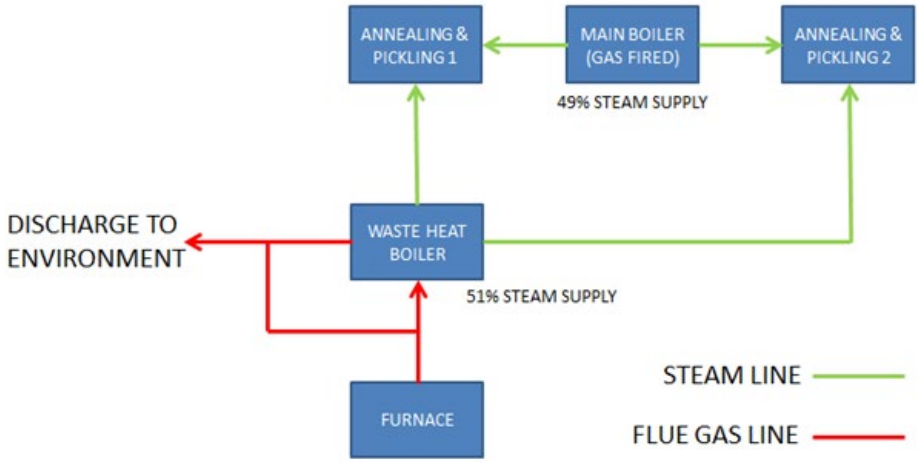
At Bahru Stainless there are 2 boilers that have been installed to supply steam to Annealing & Pickling 1 and 2. The waste heat boiler will supply steam for Annealing & Pickling 1 only and the main boiler will supply for both lines. During the hot rolling process at Annealing & Pickling 1, the waste heat boiler will generate less steam due to less demand from the process. Most of the flue gas will discharge to the environment. The current schematic layout shown that only 10% of the total steam capacity is supplied from the waste heat boiler. In order to maximize the utilization of the flue gas, a few studies have been carried out. With consultation from the machine maker, there is no impact to the machine and product quality.



Bahru Stainless picture 1: schematic layout of steam supply

Action Review

Specific; To optimize the waste heat boiler operation, the access capacity of the steam must be channelled to Annealing & Pickling 2 in order to ensure the steam can flow to Annealing & Pickling 2 without any restriction. The steam pressure at main boiler has been reducing from 5 bar to 3 bar.



Bahru Stainless picture 2: schematic layout of steam supply

Measurable; For the period Jan – Feb 2020, the steam generation for the waste heat boiler has been increased 4 times and reduced the natural gas consumption by 35%. It shows that the flue gas has been fully utilized to generate the steam with minimum discharge to the environment.

Achievable; The average steam production in 2019 (Jan – Oct) was recorded at 400MT. With the improvement activities, the waste heat boiler is targeted 1200MT per month to generate the steam.
It is expected the natural gas consumption for main boiler will reduce from 6661MMBtu per month to 3990MMBtu per month.

Realistic; Based on the observation, the operation steam parameter such as flow, pressure and temperature had no abnormality being reported.

Time-bound; The improvement works for the waste heat boiler optimization project has been completed and tested in November 2019.

Target Beneficiaries from the Action

The greenhouse gas reduction initiative is direct measures for environmental pollution and also to address international problems for climate change. It also benefits to the natural resources conservation by reducing fuel consumption by improving the energy efficiency.

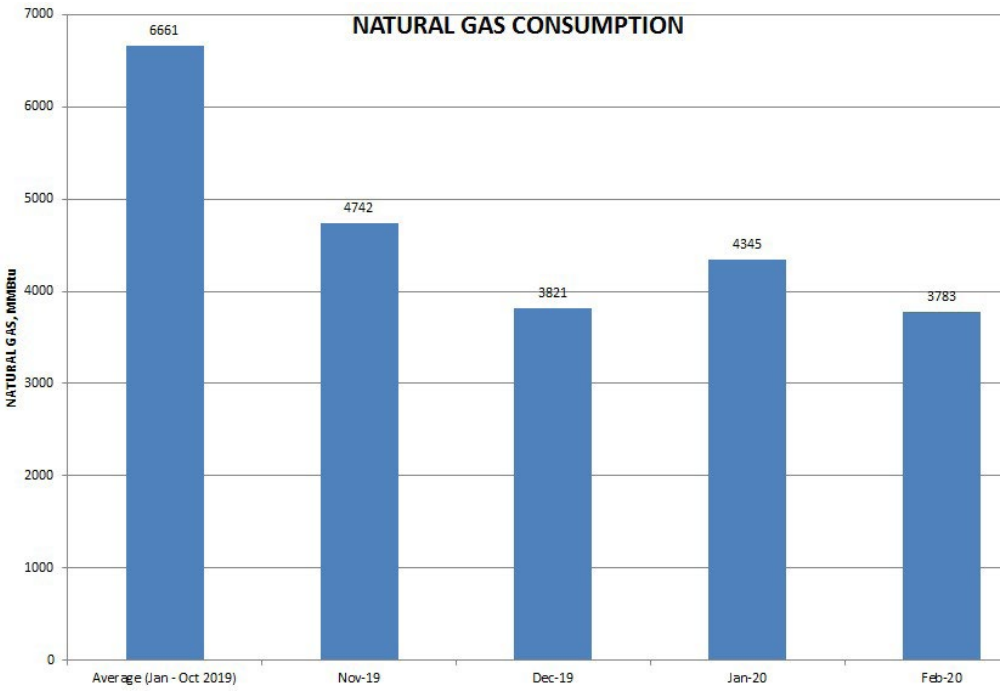
Horizontal Expansion Capability

The concept of this application can be applied to any organization to use flue gas for steam generation.

Outcome

The benefits for this improvement are as below:

1. With this improvement project, the steam generation from the waste heat boiler has been increased from 400MT to 2500MT. The dependency of the main boiler to supply the steam also reduces from 90% to 49%.
2. The natural gas consumption for the main boiler has been reduced from 6661MMBtu to 3783MMBtu.



Bahru Stainless graph 1: natural gas consumption

3. Overall, the CO_2 emission also reduced from 300 Ton/month to 205 Ton/month. It is a 32% reduction after the waste heat boiler optimized project was completed. Under scope 1 intensity, the reduction is from 0.17 to 0.16 (5.9%).

Duration	Average Boiler Gas Sm3/month	Equivalent CO2 Ton/month	Scope 1 Intensity
2019 Jan - Oct (baseline)	158,648	300	0.17
2020 Jan - Feb	108,304	205	0.16

Columbus Nitrate Recovery

Member company Category

Columbus Stainless emissions reduction; material efficiency improvement

The Challenge

Columbus Stainless is situated in an arid area, and has invested in water recovery strategies to minimise both the demand for water from the local supply, and potential impact on the receiving environment that could arise from the discharge of contaminated water. The main sources and sinks of constituents present in process effluent are indicated below:

Constituent	Source	Sink
Nitrates	Nitric acid used in pickling operations (stainless steel surface preparation and passivation)	Calcium Nitrate liquid (sold as fertiliser feedstock). Also contains sodium nitrate.
Fluorides	Hydrofluoric acid used in pickling operations (stainless steel surface preparation and passivation)	Calcium Fluoride filter cake (disposed to landfill)
Sulphates	Sulphuric Acid used in the regeneration of the cation train at the water demineralisation plant, as well as sodium sulphate used as pickling electrolyte	Calcium Sulphate (sold as fertiliser feedstock)
Dissolved metals	Removed from stainless steel surface during pickling operations	Precipitated as hydroxides in calcium fluoride filter cake (disposed to landfill)
Sodium	Sodium sulphate used in electrolytic pickling, and caustic soda used for anion train regeneration at the demineralisation plant	Calcium Nitrate liquid
Calcium	Introduced at ETP as acid neutralisation agent in the form of hydrated lime	Contributes to all product streams listed above, depending on solubility of associated compound

The output from effluent treatment operations include clean condensate which is used as process water make-up, and a concentrated calcium nitrate brine as salt sink to the entire process. This nitrate product is sold as feedstock into the agricultural market. A two-fold risk exists related to the current strategy:

- Seasonality of the agricultural market resulting in varying offtake which creates the need for a storage buffer.
- Legislative restrictions on the disposal of brines, which would impact on continued operation of the Effluent Treatment Plant in the event of prolonged depressed demand in the agricultural sector. This in turn would limit the operation of pickling facilities to the available buffer capacity in effluent storage dams.

The Crystalliser Plant (Figure 1), as final concentration step of the Effluent Treatment Plant, was originally designed to deliver the nitrate product in both crystalline sodium nitrate, and aqueous calcium nitrate phases.

Columbus Stainless figure 1: Crystalliser

Subsequent changes in annealing and pickling strategies, however, resulted in significantly lower consumption of sodium sulphate when one electrolytic pickling section was decommissioned. The result was a much lower ratio of sodium to calcium following the acid neutralisation step using hydrated lime, to the extent that the precipitation of sodium nitrate crystals from the calcium nitrate / sodium nitrate mother liquor was no longer feasible.
A market had opened up for this calcium/sodium nitrate liquor (containing predominantly calcium nitrate), and buffer capacity available on site allowed for variable offtake. Importantly at the time, legislation still made provision for the disposal of brines which addressed the worst-case scenario of prolonged low demand for the nitrate product. Disposal restrictions took effect in August 2019.

Why?

- While addressing the risk items indicated above, the opportunity also exists to upgrade the final nitrate product to one with a higher market value.
- Columbus was approached by an external service provider with a proposal for process integration, with the sodium nitrate product discussed above as an intermediate step in the eventual production of potassium nitrate.

Needed Action

Initial investigations also considered an energy savings proposal, to be effected by the replacement of the current combination of vapour (Evaporator: Figure 2) and thermal recompression (Crystalliser: Figure 1) with ion exchange and reverse osmosis treatment as concentration route. Pilot scale testing highlighted a risk associated with the final water quality (currently processed in the form of condensate), mainly influenced by inherent variation in effluent composition. For this reason it was decided to operate the water recovery and brine concentration equipment as currently installed, with the necessary changes to reagents and ancillary equipment to allow for the removal of nitrates in crystalline sodium nitrate rather than liquid calcium nitrate form.

Columbus Stainless figure 2: Evaporator

- The most significant change in terms of reagents involve a two-stage neutralisation regime, with hydrated lime contributing to initial neutralisation from a pH of 2, to about 3.5, while importantly removing fluorides as insoluble calcium fluoride. Further neutralisation to a pH of 9 requires the addition of caustic soda, for which a feed tank is being converted (Figure 3). The existing lime dosing system is also being refurbished, in the interest of more accurate dosing control associated with the two-stage neutralisation (Figure 4).

Columbus Stainless figure 3: Caustic tank

Columbus Stainless figure 4: Lime silo

- Laboratory work was done to evaluate the impact of existing scale inhibition treatment on crystal formation (Figure 5). Crystal size has an important effect on the efficiency of separation in the existing pusher centrifuge (Figure 6). Testing to date, across the concentration range of anti-scalant expected to be present in the mother liquor, point to acceptable crystal characteristics.
- Plant scale testing is set to commence once the required refurbishments are complete.
- In line with the proposal for further conversion of the sodium nitrate to potassium nitrate, concurrent test work is underway at the facilities of the third party technology provider. Testing considers the effect of variations in Columbus' process effluent on the nature of sodium nitrate crystals, and eventually on the proprietary process for the final conversion to potassium nitrate.

Columbus Stainless figure 5: Sodium nitrate crystals

Columbus Stainless figure 6: Centrifuge

Action Review

Specific; At all stages of the process, actions had specific outputs – whether in terms of water quality, nitrate product quality, process integration or practical operability.

Measurable; Outputs are generally measurable. Direct measurements were done on effluent and treated water composition, while longer term effects like energy consumption and scaling behaviour would have to be observed from plant performance indicators.

Achievable; The general approach for evaluation in relation to this point was theoretical calculation, followed by laboratory and then pilot scale testing. Where outputs (permeate water quality is a case in point) proved to not be currently achievable, these were relegated to future improvements so as to remove from the critical path of the project.

Realistic; Most of the proposed changes are based on technology in the effluent treatment industry.

Time-bound; Progress is continually updated on a Gantt chart.

Target Beneficiaries from the Action

- Company: Reduced environmental and operational risk, as well as the potential for increased revenue from the sale of by-products.
- Local businesses: The project is run with a strong focus on Enterprise and Supplier Development, as related to National Broad Based Black Economic Empowerment legislation.

Horizontal Expansion Capability

Theoretically it could, but is highly dependent on the nature of existing effluent treatment operations, as well as regional environmental legislation.

Outcome

Action at this point still in pilot testing. Benefits are expected in the following areas:

- Reduced risk of environmental impact, if final salt load could be handled in solid rather than liquid form.
- Reduced operational risk, given that the need for a liquid buffer is removed and pickling operations can continue.
- Financial benefit (crystalline product has a higher market value than the current liquid product, but final sales price will form part of agreement with the external service provider).

The Improvement of Energy Loss in the Heat Treatment Furnace

Member company Nippon Yakin Kogyo Co., Ltd.
Category energy intensity reduction

The Challenge

We tried to reduce excessive liquefied natural gas consumption at the No1 heat treatment furnace in the plate factory.

Why?

The furnace has two doors, one is large, and the other is small. When putting in and taking out plates, the small door closes after the big door has closed.
We needed to increase the gas output to maintain temperature in the furnace until closing the small door.
Therefore, the gap of the timing leads to excessive LNG consumption.

Needed Action

We tried to reduce gas consumption by altering the timing of the small door closing.
The door's closing timing has been changed as follows;

- At the time of inputting plates, it closes 1 second earlier than the large door.
- At the time of taking out plates, the doors close at the same time.

Action Review

It is controlled automatically by rewriting the program, so we can prevent wasteful power consumption regularly.
It is carefully adjusted, because these doors use a different power source.
(The small door is pneumatic, the large door is motor driven)

Target Beneficiaries from the Action

It contributes to a cost reduction and environmental protection by reducing the LNG consumption.

Horizontal Expansion Capability

There is a possibility that we can reduce more energy consumption by improving the other furnace in our Plant.

Outcome

The processing time of putting in and taking out plates has been shortened by six seconds (2 seconds for putting in + 4 seconds for taking out).
That has led to a reduction of 580 Sm^3 LNG per month (supposing 1500 batches per month).

Replacement of the Wastewater Treatment Facility

Member company Nippon Yakin Kogyo Co., Ltd.

Category workplace improvement; investment in new processes and products in order to deliver a defined sustainability benefit

The Challenge

To renovate our old wastewater treatment facility to strengthen against a natural disaster and deterioration.

Why?

1. There is a risk of collapse by future earthquakes or tidal waves, because it is built close to the canal.
2. There is a risk of leakage due to deterioration, it was built about 50 years ago.

Needed Action

1a. We drove a stake into the ground to a depth of 60 meters for earthquake resistance and liquefaction countermeasure. (picture 1)
1b. Raised the treatment tank above the ground. It can withstand a tidal wave of up to 5 meters high. (picture 2)

2a. Made a double bottomed tank for early detection of leakage and soil contamination countermeasure. (picture 3)
2b. Organized pipes (picture 4) and set pans to prevent scattering if a leakage occurs.

3. Dug pits to gather leaked liquid for each area, and set pH meters to detect leakage.

Picture 1

Picture 2

Picture 3

Picture 4

Action Review

We set a goal to withstand an earthquake with an intensity of upper 5 for the replacement. It is estimated the possibility of earthquake occurrence with an intensity over upper 5 around Tokyo within next 30 years is 99.8%.
We also set a goal to withstand a high tidal wave of about 5 meters, and accomplished it.

Target Beneficiaries from the Action

Our stakeholders have benefited from this replacement, because it will contribute to a stable operation and environmental conservation.

Outcome

1. The facility got resistance to an earthquake with a seismic intensity of upper 5, liquefaction, and to a 5 meters high tidal wave.
2. The replacement made it possible to prevent leakage and early detection of leakage.

Beneficial Reuse of WWTP Sludge

Member company Category

North American Stainless investment in new processes and products in order to deliver a defined sustainability benefit

The Challenge

Lime stabilized pickle liquor sludge is produced from the neutralization of pickling acids at Waste Water Treatment Plants (WWTPs). After pressing the sludge to reduce water content, the sludge is sent to a landfill for disposal. This sludge has very high lime content and contains metals from the pickling process.

Due to the high lime content, the landfill owner/operator who was accepting this waste stream requested that the volume of sludge being sent to the landfill be reduced to 1) increase the overall lifespan of the landfill and 2) prevent the potential for unstable condition as the ratio of sludge to general refuse may cause a slide during normal operations. This waste stream constitutes 89% of the non-hazardous waste at NAS and diverting this much material to another landfill of similar size would possess the same potential liability. NAS investigated several different recycling options and reuses but was not able to identify any other reasonable reuse options.

Why?

The landfill owner requested the volume of WWTP sludge going to their landfill to be reduced. NAS needed to identify other outlets to accept the waste or to find an alternative use.

Needed Action

First action, NAS set out and continues to search for ways to reduce the quantity of acid used at the mills to reduce the quantity of sludge being generated. Second, NAS still needed to find an alternative disposal technique or use of the sludge. Several years ago, the NAS's lime supplier asked NAS for high lime bearing waste to be used as backfill in their mine to 1) reduce the volume of ventilation required for the mine and 2) to provide stability to the mine's pillars.

After discussing with the lime supplier the current dilemma NAS has with the landfill owner, the lime supplier became interested in our WWTP sludge for use in their mine. After testing and evaluating the sludge characteristics, it was agreed that the most efficient way to introduce the material into the mine was by using an injection well. To this end, the lime supplier was able to obtain an Underground Injection Well Permit to use both WWTP sludge and sediment from a storm water reservoir. The lime supplier will now take our sludge, rehydrate it on their site and pump the material to the areas where it is needed. This material will be mixed with stormwater reservoir sediment and mine overburden to create backfill in the mine.

Action Review

Specific; WWTP sludge, and storm water sediment have been approved for mine backfill according to the permit for the underground injection well.

Measurable; 100% of the WWTP sludge from NAS can be beneficially used in the mine as backfill material.

Achievable; The permit has been obtained and construction has been initiated.

Realistic; The location of the mine is a short distance from NAS and will make the beneficial use of the WWTP sludge economically feasible. A contract has been completed so the WWTP sludge will be placed as backfill.

Time-bound; The piping to inject the material will be completed within 4 months. WWTP sludge is 89 % of the solid non-hazardous waste produced at NAS. NAS will divert 89 % of our total waste from being landfilled.

Target Beneficiaries from the Action

The landfill will benefit as the lifespan of the facility will be greatly extended and waste from the regional community will have a viable landfill for years to come. The landfill will also benefit in safety as the ratio of sludge to general refuse will not be a consideration for the potential of a landfill slide.
The mine will benefit as it will reduce the ventilation required and will provide stability to the mine pillars as the mine areas are filled.

Horizontal Expansion Capability

Based on the characteristics of their lime stabilized pickle liquor sludge, other steel companies may be able to qualify their sludge for use in this manner at other mines.

Outcome

The benefits of sending the material to the mine is that the material will not be placed inside a landfill, but will be providing benefits to the mine from which the lime was originally extracted. The sludge is not hazardous and is below groundwater level so contamination of groundwater will not occur. When this sludge is placed into the mine, less ventilation will be required, and when significant quantities are in place, it will provide strength to the pillars that support the mine ceilings from collapse.

Beneficial Use of Used Tundish Lining

Member company North American Stainless

Category Investment in new processes and products in order to deliver a defined sustainability benefit

The Challenge

Currently the leftover lining of tundish are being landfilled after the casting sequence has been completed. Over the past 5 years, North American Stainless has used an average of 101 tundishes per month. It is estimated that 90% of the working lining weight remains after each sequence, leading to an average of 182 MT of material being landfilled each month. The linings from the tundish consist of approximately 85% MgO, making it a good alternative source of MgO to use as a slag former in the EAFs. The reuse of this material would reduce our quantity of waste to the landfill and purchases of dolomitic lime.

Why?

This challenge was made to determine if the recycling of tundish lining will reduce waste generation, raw material purchases, and overall CO_2 emissions.

Needed Action

1. Tundish lining was sampled and analyzed to determine the true MgO content.
2. The quantity needed to be added to each heat was then calculated (1600 Kg/heat)
3. Material was collected and then bagged (22,800 Kg/bag)
4. Material was trialed on 11 austenitic grade heats (6 in EAF1, 5 in EAF2) (Slag samples were collected before, during and after these trials)
5. Visual and chemical analysis of collected slag was conducted
6. Quality of slag composition was determined to be sufficient and should not have any negative downstream effects
7. Determined a logistical solution to continue this process for the long term

Action Review

Specific; NAS wanted to determine if used tundish lining can be reused to reduce waste, and raw material purchases.

Measurable; Samples of the tundish lining taken prior to and during the trial were used to determine the average MgO concentration of the tundish lining material. The MgO concentration was necessary to estimate the quantity of tundish lining material to be used for each heat. Slag samples were taken throughout the trial to determine if the trials were successful. Slag samples were visually inspected to verify that the slag appearance did not change and were analyzed to verify that the chemistry of the slag was not altered. The trial showed that there were no changes to the slag when using the tundish lining material.

Achievable; The used tundish lining is a powder when it is dumped from the tundish, therefore minimal processing is necessary for use in the heats. The tundish lining is cooled and then placed in supersacks. The tundish dump area can also be used as the bagging area and temporary storage/staging area until the bagged tundish lining is needed. A scale, and hopper are the only additional equipment needed to bag the material.

Realistic; To achieve our goal, the used tundish lining and slag were tested and analyzed. Once it was determined the trials were a success, a logistical solution was put in place to bag the material long term. The used tundish lining is usually

available, depending on the number of sequences produced each month and the need for cheaper, alternative MgO units is constant. A reduction of CO_2 emissions will be achieved with the reduction of purchased calcined dolomitic lime.

Time-bound; A bagging area is being created in the tundish dump area and should be completed by the end of February. Once this is complete the material will be bagged and loaded directly into the furnace. The contract is being negotiated with an onsite contractor to include the bagging of the used tundish material.

Target Beneficiaries from the Action

The host company and community will benefit from this practice because NAS will be reducing the amount of material that is landfilled thus extending the lifespan of the landfill for the community to use. NAS and the employees will benefit by saving money by reducing the number of flux purchases. The total global carbon footprint will be reduced due to the material being calcined once and used twice.

Horizontal Expansion Capability

Yes this concept could be used in other member companies where they have a furnace with MgO additions and similar tundish lining composition.

Outcome

By recycling this material NAS would have been able to save approximately $580,000 last year, assuming 182 MT of Tundish material is recycled each month. In addition by reusing the material, the reduction of CO_2 output would be reduced by at least 2900 MT per year due to the reduced need of calcined material purchases.

Honey Made by Outokumpu

Member company Outokumpu

Category protection of scarce resources; investment in new processes and products in order to deliver a defined sustainability benefit; value to the customer / society

The Challenge

Species of plants and animals across the globe are disappearing at alarming rates. The UN Sustainability Development Goal 15 addresses biodiversity and the need to preserve biodiversity and use ecosystems sustainably.

Why?

According to the UN's data, there are between 25,000 and 30,000 species of bees, and preserving the diversity of bees and other pollinators is key to mitigating the impact of climate change on agricultural production and, consequently, the fight against world hunger. At our Dillenburg site in Germany, wildflower meadow meets stainless steel mill. The surprising wealth of plants and blossoms on our plant premises provides nutrition for numerous insects. The diversity of pollinators is important because different species have different traits and reactions to various temperatures and habitats, making their diversity necessary for pollination in current climate conditions but future ones as well, according to the UN.

Needed Action

We have among our workforce an avid hobby beekeeper, who together with other team members have created a wildflower meadow to support the protection of endangered insect species and foster biodiversity. During the summer, the project team also set up beehives. The first honey "made by Outokumpu" will be bottled in 2021. This will be done in cooperation with a local charity organization that will collect the sales revenues.

Action Review

Specific; Yes, a limited project related to biodiversity

Measurable; The number of bees in the beehives as well as flowers in the meadow give an indication of the biodiversity of the specific environment

Achievable; Yes, this is a local, small scale project

Realistic; The wildflower meadow provides a suitable surrounding for the project

Time-bound; Results can be seen when the honey is to be collected the following year.

Target Beneficiaries from the Action

Employees; working on projects that improve the local community fosters employee well-being
Local community: Protection of local biodiversity; pollination of surrounding plants.
Local community: the revenue of the honey goes to local charity organisation

Horizontal Expansion Capability

The project can be applied anywhere, it is small scale, but shows how we with small means can contribute to biodiversity and local community

Outcome

Employee led projects like this are contributing to employee well-being

Quantifying the Benefits of Slag Use

Member company Outokumpu

Category protection of scarce resources; material efficiency improvement; value to the customer

The Challenge

During the steelmaking process significant amounts of slag are produced as by-products. To achieve the societal goals of circular economy we should be able to use these mineral products instead of discarding them as waste. One way is to substitute natural aggregates in road making with slag products. This has been done for decades already with Outokumpu OKTO slag products. OKTO is a CE certified construction product and used to replace natural aggregates in road and basement structures. Outokumpu manufactures both steel and ferrochrome on the same site and the current use rate of slag is close to 100 %.

Why?

There is a growing interest to quantify the potential environmental consequences of using slags, especially with regard to CO_2 emissions and footprints. Today there is not that much data on this available. Our customer Destia, a Finnish infrastructure and construction service company that has used slags in some road projects were interested to quantify the environmental benefit of slag use. Together with Destia we decided to make an emission calculation comparison on an existing road structure.

Needed Action

It was decided to make a case study together with Destia. The aim of this study was to find out the carbon footprint (CO_2-equivalent) of traditional road structure (sand, crushed rock) in comparison to the OKTO structure in an actual road construction in northern Finland, using available initial data. CO_2e emission calculation was done for differences between structures when OKTO replaces part of the traditional materials. OKTO insulation, which is made from ferrochrome slag had been used in this road construction due to its resistance to frost damage in the cold and wet climate.
The construction site of the case road locates 48 km from Outokumpu mill and between 8 to 30 km distance from natural raw material sources. Calculation shows that carbon footprint (CO_2-equivalent) of OKTO structure was much smaller than the carbon footprint of traditional road structure despite of longer transport distance of OKTO to the construction site. The footprint of the OKTO structure was about 40 % compared to the traditional structure. However, as transport has a significant effect on the footprint, the location of the construction site and its distance to the mill will have a big impact on the results.
It was also recognized that a traditional road structure on the same roads would have needed about 260,000 tons more sand and about 38,000 tons more crushed rock. While this study focused only on the CO_2e emissions, it is evident that avoiding excavation of this amount of natural sand and rock impacts also resource depletion and circularity. However, this has not been quantified.

Action Review

Specific; The case was calculated for a specific construction site.

Measurable; Source data, which is used in the study, are based on mass quantities that were calculated in Destia's bid counting. The calculation was made

by using verified OneClick LCA program of Bionova which is a browser-based cloud service for environmental and life cycle assessment of infrastructure and building construction.

Achievable; Based on the calculations, we received a comparison of the respective footprints of the alternatives

Realistic; This case study is directly applicable to the existing construction site. It gives an indication about hot-spots and significant emissions that are applicable also when considering other projects.

Time-bound; The study was performed on an existing construction project and the calculations have been finalised.

Target Beneficiaries from the Action

Outokumpu and Destia as supplier and user of the slag have gained knowledge and quantified information on footprints for road construction using slag. This can be used to improve emission calculations on similar kind of projects.

Horizontal Expansion Capability

The principles on how to calculate footprint comparison for road constructions can be applied also on future projects as well as considerations and lessons learnt from the current study.
Emission calculations of construction are slowly becoming more common in infrastructure, but the challenge at the moment is the lack of guidance.
A calculation method standard is currently being prepared that follows the EN 15804 standard for sustainable construction, extending it to the needs of infrastructure projects. So, the calculation to infrastructure project will been evolved and refined.

Outcome

The use of slag instead of natural aggregates can significantly reduce the CO_2e footprint of a road construction. The CO_2e reduction was about 600 t CO_2e for this road construction site.
In addition the use of slag saved natural resources; 260,000 tons sand and about 38,000 tons crushed rock

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About ISSF

The International Stainless Steel Forum (ISSF) is a not-for-profit research and development organisation which was founded in 1996 and serves as the focal point for the global stainless steel industry.

Vision

Sustain our future with stainless steels

Membership of the ISSF

ISSF has two categories of membership namely:

a. company members who are producers of stainless steels (integrated mills and re-rollers)
b. affiliated members who are national or regional stainless steels industry associations.

The ISSF now has 57 members in 26 countries. Collectively they represent approximately 90% of the total production of stainless steels.

More information

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