



Brownfields and greenfields

Tata Steel: Protact® production line enclosure

Suiker Unie: extending the beet-washing line

Upgrading older cranes to current standards



Newsletter of TCS / November 2017

Fun

Albert Einstein has said so many brilliant things, you should never miss an opportunity to quote him. One of my favourites, often attributed to the genius of relativity, goes like this: “Everything should be made as simple as possible, but not simpler.” While it sounds contradictory (you can’t make things simpler than possible, can you?) and was probably said in a specific philosophical context (paraphrasing Occam’s razor perhaps?), it does make sense in the broader perspective. For me, the quote is about common sense. Don’t overcomplicate things, but also stay away from oversimplification.

This is a constant challenge in any business, especially in technical issues. It often comes down to a struggle between engineers (advocating high-tech solutions) and budget owners (demanding costs are kept down). Striking the golden mean can only be achieved through consultation and dialogue. That’s what we live through again and again with customers. Take a look at some of the projects we talk about in this newsletter: the protection system we developed together with Tata Steel, the unloading facility we constructed at Sabic, the crane safety mechanism we redesigned at ArcelorMittal, and the fatigue-resistant structure we built at a production site in Turkey, to name just a few. Tough challenges mean intense dialogue.

But they also need that little extra element called creativity, the ability to identify hidden opportunities and develop unexpected but smart solutions. Which brings me to another famous Albert Einstein quote: “Creativity is intelligence having fun.” We do have a lot of fun here, and I hope you do too.



Bert Zimmermann
CEO

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Making the case for brownfield development

A plea for globally optimised solutions

Brownfield redevelopment is on the increase, probably arising from factors such as post-crisis caution, land scarcity and burgeoning environmental regulation. But the re-use of existing industrial infrastructure brings with it special challenges, calling for greater sharing of expertise between designers, engineers, manufacturers and onsite teams.

KEY FACTS

- Brownfield development is on the increase but brings with it special challenges.
- Compartmentalised tendering discourages companies from globally optimising their solutions.
- Increased exchange of expertise between designers, engineers, manufacturers and onsite teams will improve the case for brownfield development.

Greenfield sites zoned for industrial use are becoming scarcer, especially in the western world. Cost may also be at issue, since greenfield site development generally requires additional off-site investment for public utilities, such as water supply, sewage infrastructure and storm drain provision. Sustainability concerns and environmental regulation also tend to provide an incentive for businesses to redevelop existing industrial sites rather than look for undeveloped land.

Technical challenges and risks

However, brownfield sites enjoy a somewhat mixed reputation. Most developers insist that it's much easier to develop industry on a greenfield site. Brownfield sites have more constraints, both legal and practical, and the risks are sometimes perceived to be higher. Existing infrastructure and buildings must be adapted to the new needs, which may bring significant technical challenges and always lead to compromise. This can affect success factors such as functional and operational flows, maintainability of the buildings, and even the attractiveness of the site.

“The practice of calling for separate tenders for the design, engineering, detailed study, manufacturing and construction stages misses the opportunity to reduce overall costs”



Construction companies with a comprehensive service, from design through to build, call upon valuable field expertise at all stages of the project, leading to significant overall cost savings.

Unsuspected possibilities

Yet the hesitation over brownfield sites can be counteracted, says Dirk Teuwen, Business Unit Manager Steelworks at TCS. “Most functionally outdated industrial buildings offer far more possibilities to host new functions than people generally assume. They often are also in much better shape technically than you would think. That goes especially for steel structures. But of course, a certain technical expertise is required to assess their state and quality.”

competition - encouraging keen pricing - it fails to reduce the overall cost. A design team with little or no engineering or manufacturing expertise is unlikely to identify opportunities for re-use. Similarly, an engineering office with little field expertise may overlook opportunities to upgrade feasibility or simplify onsite activities.”

Inadequate tendering method

Inadequate preliminary analyses lead to missed opportunities for re-use, which can significantly increase the cost of brownfield redevelopment. Dirk Teuwen points out why it often goes wrong: “There is a tendency among developers to compartmentalise construction projects, calling for separate tenders for the design, engineering, detailed study, manufacturing and construction stages. While this method increases

Globally optimised solutions

Teuwen therefore advocates non-compartmentalised tendering. “This will encourage tenderers to globally optimise their solutions and not just keep costs as low as possible at each individual stage. What’s more, it will attract those construction companies with a comprehensive service, from design through to build. Such companies are more inclined to call upon valuable field expertise at all stages of the project, leading to significant overall cost savings. This will clearly improve the case for brownfield development.” ■

Addressing fatigue issues in steel construction

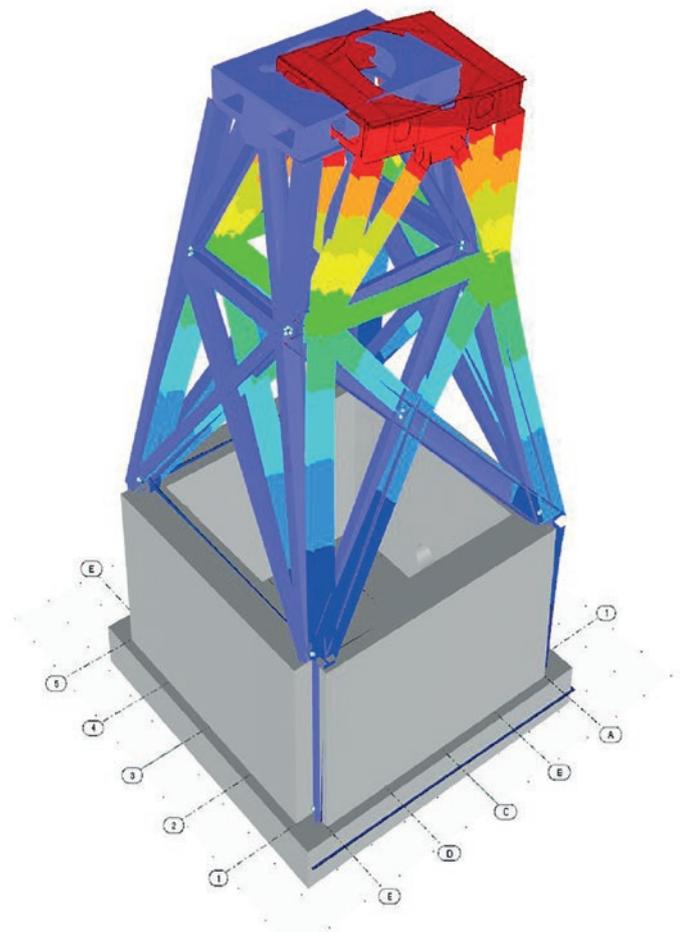
Dealing with vibrations and thermal-mechanical stress

The calculation of steel structures is often regarded as just a static affair. However, cyclical dynamic loadings may well occur in industrial contexts and can sometimes induce fatigue, which in the long run causes structural damage. Two recent projects carried out by TCS illustrate the importance of taking into account the effects of cyclic dynamic loads when designing steel structures.

KEY FACTS

- While cyclical dynamic loading issues are somewhat uncommon in steel construction, they can be crucial in some industrial contexts.
- The presence of vibrations may significantly impact design, as well as the manufacturing and construction process.
- A number of recent projects illustrate how expert intervention is required to successfully address fatigue issues.

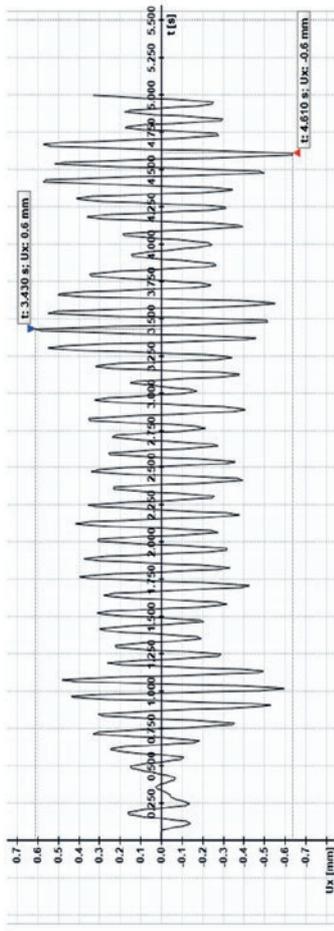
The melting pot induces hefty but hard-to-predict vibrations along a broad frequency spectrum and in different directions. ▶



“Most engineering firms tend to view the calculation of steel structures as a straightforward static problem,” says Dirk Teuwen, Business Unit Manager Steelworks at TCS. “Typically, the only dynamic loads brought into the equation are the effects of wind and seismic excitation, which in most cases don’t really complicate matters. But it’s an entirely different story when your steel structure is subject to vibrations induced by industrial equipment. In these cases, you need to comply with Eurocode 3 Part 1-9. This may have a significant impact on the design as well as on the manufacturing and construction process. For example, you will need to weld to a higher classification standard, apply full penetration welding rather than fillet welding, use pre-stressed bolts and bore close tolerance holes for fitted bolts.”

A jacuzzi of boiling material

Vibrations were a major preoccupation in a recent project carried out for a plant in Turkey. “TCS was charged with designing and constructing the supporting steel structure of a new production unit,” Dirk Teuwen explains. “At the core of the production line is a large melting pot where recycled material is melted and kept at a boiling temperature above 1700°C. The pot is like a giant bubbling jacuzzi, inducing hefty but hard-to-predict vibrations along a broad frequency spectrum, and in different directions. These vibrations are transferred to the 13-metre high supporting steel structure, which has a 6 by 5-metre base. Fatigue-proof design and construction of this steel structure was crucial, and an additional challenge was the comfort requirement to keep deflections at the top of the structure to less than 1 millimetre.”



Time history analysis

The proof of the pudding

Due to the unpredictable nature of the vibrations, advanced analysis techniques such as rainflow-counting had to be used. TCS Engineer Peter Neven explains: “The essence of rainflow-counting is that it reduces a complex spectrum of varying stress to a set of simple stress cycles to permit the resulting fatigue damage to be assessed. The analysis allowed us to iteratively adapt the supporting structure to achieve an expected lifetime of at least 20 years. Of course, we also optimised welding work and other details to reduce stresses, and improve fatigue-resistance. After completion of the structure and subsequent production start, we carried out a comprehensive measurement campaign to precisely measure any occurring deflections, deformations and strains. The results were very much in line with our calculations and so provided additional proof that our model was valid and reliable.”

Intermittent exposure to heat

The need for a thorough fatigue assessment was obvious at the plant in Turkey, but that’s not always the case. This is illustrated by the story of the Aperam steel melting shop in Genk where problems occurred in the steel structure of a transportable exhaust hood. “The hood allows the exhausts produced during the steel melting process to discharge,” explains Dirk Teuwen. “However, some years after installation, cracks formed in the hood’s rail beams. Despite a repair operation, things got even worse a year later. TCS was then called in as an independent expert to analyse the problem. ▶

“Steel structure suppliers sometimes fail to take into account exposure to cyclical dynamic stresses”



▲ Fatigue-proof design and construction was crucial, and in addition deflections at the top of the structure had to be kept to less than 1 millimetre

We found that the exhaust hood supplier had failed to take into account the fatigue cycles caused by the moving exhaust hood. Furthermore, the intermittent exposure to extreme high temperatures from the melting pot below induced additional stresses. We found that the beam design was ill-suited to withstand these cyclical stresses, leading to fatigue and the formation of cracks. So, we replaced the beams with new, appropriately designed and carefully manufactured beams.”

Decades of experience

TCS’s engineering expertise with dynamic loads mainly stems from its business as a crane manufacturer.

“Overhead and portal cranes are, by nature, cyclically loaded structures,” explains TCS engineer Peter Neven. “Design for fatigue resistance is standard practice in crane engineering, so we’ve been into it for decades. Our workshop people are also familiar with the required welding and bolting details and they provide us with valuable advice and feedback. This makes us the perfect partner to address vibration or thermal-mechanical stress issues in steel structures.” ■

A new life for ‘granddad’

Upgrading older cranes to current standards

Crane revamping is a growing business. There is now greater awareness among business owners that even very old portal or overhead cranes can compete functionally with new equipment when they are given an appropriate upgrade. There’s one essential prerequisite: a pro-active and flexible crane service provider.

KEY FACTS

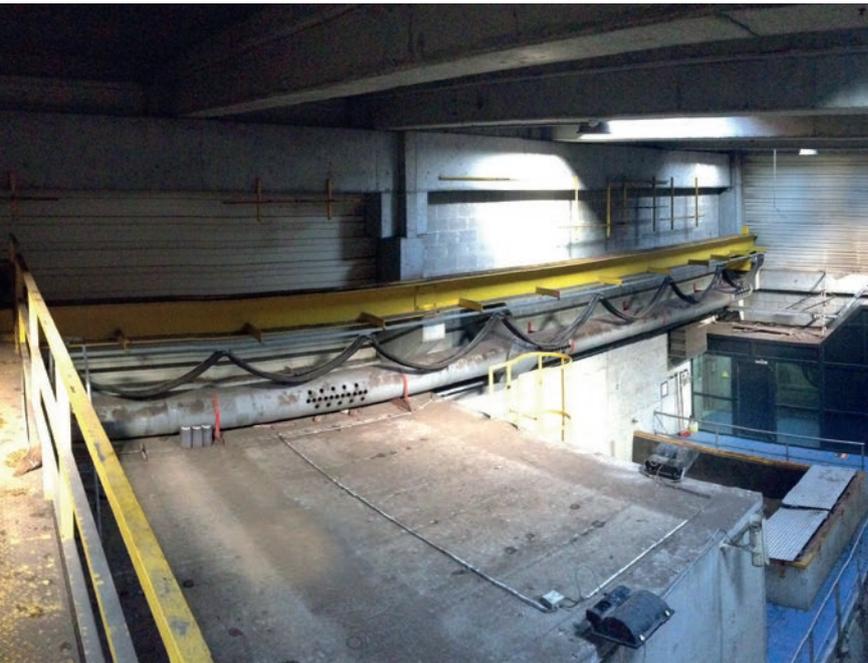
- Older cranes can be given an extended lease of life with an appropriate upgrade.
- Recent projects illustrate the importance of having a pro-active and flexible crane service provider.

The sagged rail was taken away to allow the foundations ►
to be reinforced and levelled out, before it was refitted and
precisely re-aligned.

A continuous lifetime extension approach has become almost customary for newer cranes in recent years, but that was not the case for cranes installed 30 or more years ago. Many of these vintage cranes have been maintained and updated in a rather *ad hoc* manner with the emphasis on corrective maintenance and compliance with the latest safety standards, and less on reliability, operating comfort and long-term performance. Nevertheless, some of these older cranes are still critical for business so it is a wise move to give them appropriate attention by carrying out lifetime-extending improvements, as illustrated by some of the recent revamp projects carried out by TCS. ►



- ▼ Worn-out cabling was replaced and electrical equipment upgraded.



▲ Before renovation.



▲ After renovation.

Beyond just problem solving

Several upgrades and improvements have been carried out on the two portal cranes owned by Port of Liège logistics operator Renory. Both had been in use since the 1980s but recently some issues had emerged, says Renory director Patrick Van Geneugden: “Crane 1’s travelling wasn’t as smooth as normal and Crane 2 made a screeching noise during operation. As part of scheduled maintenance, TCS took a closer look and found that one rail of Crane 1 had sagged a little and Crane 2’s trolley rails were completely worn-out. They warned us that both issues could lead to severe structural damage to the cranes. We therefore decided to correct the problems immediately.”

The sagged rail was taken away so that the foundations could be reinforced and levelled-out, before it was refitted and precisely re-aligned. The trolley rails of Crane 2 were replaced with new ones. In addition, a plan was made to further modernise both cranes. Electrical equipment and cabling is soon to be replaced and LED lighting will be installed to improve safety and operating comfort. “That will bring our old cranes right up to current safety, performance and reliability standards,” concludes Van Geneugden.

Eliminating worries

A slightly different story reinforced the point at Aquafin’s Deurne water treatment station in Deurne, where the electric cabling of a 1980s-era overhead travelling crane was completely worn out due to year-round exposure to a corrosive atmosphere containing methane and hydrogen sulphide. Maintenance manager Georges Peters explains: “The crane is critical for us during the plant shutdown period when it is used for maintenance. But we were increasingly worried about its poor reliability, and especially the condition of the electrical cables, which had caused a number of equipment breakdowns in recent years. Following the latest incident, we issued a request for quotation among crane service providers. TCS provided the best offer, convincing us that they would be able to replace the cabling before the crucial plant shutdown period and at the same time also upgrade the associated electrical equipment. They lived up to their promise. It is comforting to know that our old machine is now as reliable as ever.”

“A plan was made to bring our old cranes completely up to current safety, performance and reliability standards”

Even in difficult circumstances

Interventions have also been carried out at titanium dioxide producer Kronos Europe, in the Port of Ghent, where three 1980s-era production cranes were showing signs of severe wear and tear. Analysis revealed that one crane needed to be replaced entirely but that the two other cranes could be given an extended life with an appropriate upgrade. Project manager Filip Roelandt explains: “The structure of the cranes was found to be in good shape but some of the

components needed to be replaced. Importantly, TCS proposed further modifications to bring the technology up to current standards, improve maintainability and the accessibility of critical components, and simplify problem identification. What’s more, TCS was the only company willing and able to carry out this renovation, as other firms had backed off because of the difficult assembly conditions and the tight manoeuvring space.” ■



◀ Assembly conditions were difficult and manoeuvring space was tight.

General Contracting

Investment strategy bearing fruit

Roba Metals: a family business with vision

In general, family owned businesses are more inclined to make difficult but courageous decisions for the longer term. A telling example is Roba Metals, a Dutch company which specialises in the production and sale of flat metal products. "In the midst of the enduring economic crisis, we decided to invest rather than to back off. This strategy is now bearing fruit," says Roba Genk plant manager Maurice Rothkrantz. ▶

The policy of keeping stocks is part of Roba Metals' strategy. ▶







▲ Roba Metals Genk extended its stainless steel and aluminium service unit by 5000 m².

KEY FACTS

- Supply flexibility is a major strength of flat metal service and sales company Roba Metals
- Recent infrastructure investment is bearing fruit

Roba Metals was established as a family business in 1937. Its initial focus was on metals recycling and the sale of steel sheets, but a diversification strategy was embarked upon in the 1980s, leading to a flourishing business in non-ferrous metals, stainless steel and aluminium all over Europe. Today, the company – still a family business – operates service and sales centres in the Netherlands, Belgium, Germany and Poland, as well as non-ferrous metals production plants in both the Netherlands and Belgium.

The service centre in Genk (Belgium) was set up in 1996. It converts steel, stainless steel and aluminium

“Our sustained policy of keeping stocks has helped us remain flexible”

coils into flat sheeting and strips for use in a wide variety of products, including home appliances, tanks and silos, automotive parts, and food and pharmacy process equipment.

A strategy of keeping stocks

Unlike most of its competitors, the plant keeps significant onsite inventories of both coils and finished products, and this is deliberate company strategy. Maurice Rothkrantz explains: “In our sector, there has been a trend towards trimming inventory levels to cut costs, especially during the recession. But in many cases, this has eroded supply chain flexibility, which is of utmost importance if we are to successfully deal with the changes going on in downstream markets. By contrast, our sustained policy of keeping stocks has helped us remain flexible.”

Keeping pace with the recovering economy

Recent investment in infrastructure has been made to further strengthen the plant’s competitiveness. Here, Maurice Rothkrantz hails the long-term vision of a family business like Roba Metals: “Despite the recession and the poor economic outlook, the Board of Directors was courageous enough to decide to construct a 3500 m² steel coil and sheets storage facility as well as a 5000 m² extension of our stainless steel and aluminium service unit. This investment is now paying off, since it allows us to keep pace with the recovering economy.” ■



- ◀ The new steel coil and sheet storage facility strengthened Roba Metals' competitiveness.

Specifications

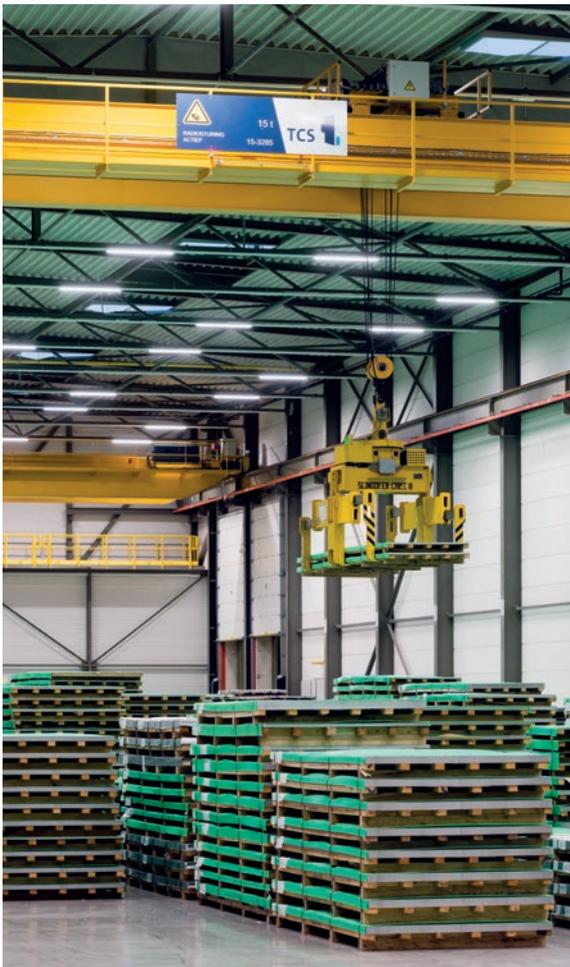
TCS carried out the extension project as general contractor. This included modification and extension of the logistics infrastructure. "It was great to have the complete solution provided by one company, because it made for an optimised design and a smoother project. And it's a pleasure to do business with TCS, with the strong mutual respect between project teams."

Extension of the stainless steel and aluminium service unit:

- 416 tonnes steel, 5250 m² steel deck, 2322 m² reused and 806 m² new insulated steel sheets, and 4657 m² fire resistant aerated concrete walls.
- Supply and installation of logistics infrastructure:
 - 167 metres of new Burbach rails with expansion joints, including new conductor lines.
 - 2 new 28-metres 15-tonnes overhead cranes with appropriate coil and sheet metal tongs.
 - A new 27-tonnes coil and sheet transfer car equipped with automatic control and obstacle/person detection. Installation included rails and foundations over a 50m track length
 - Relocating an existing overhead crane into the new building and renewing radio control on all existing cranes for conformity and operator convenience.

Steel coil and sheets storage facility:

- 368 tonnes steel, 4150 m² steel deck, 2620 m² insulated steel sheets, 2918 m² Kingspan vertical sandwich panels, and 3984 m² fire resistant aerated concrete walls.
- Supply and installation of logistics infrastructure:
 - 135 metres of new Burbach rails with expansion joints, including new conductor lines.
 - 4 new 28-metres overhead cranes with capacities of 32 tonnes, 15 tonnes and 8 tonnes with appropriate coil and sheet metal tongs.
 - Extending a 60-tonnes coil transfer car with a 27-tonnes sheet carriage equipped with automatic control and obstacle/person detection. Installation included renovating, reinforcing and extending the existing floor and foundations over a 100m track length.



- ◀ A series of new overhead cranes with appropriate coil and sheet metal tongs were installed.

Enclosing the Protact® production line

Flexible protection system at Tata Steel plant

Tata Steel Packaging in Duffel (Belgium) has installed a unique protection system at their Protact® packaging material production line. Designed for quality assurance, the system was developed in close collaboration with TCS, whose engineers drew inspiration from facilities as diverse as cleanrooms and concert tents.

KEY FACTS

- Quality assurance at Tata Steel Packaging in Duffel (Belgium) required the Protact® production line to be encapsulated.
- TCS drew inspiration from their experience with concert tent design to develop a transparent, modular, lightweight and easy-to-use protection system.
- The solution can be tailored to various types of production processes.

Protact® is Tata Steel's patented food-safe material used in the manufacture of cans for food, drinks and aerosols. It is made from a steel substrate with a three-layer polymer coating on each side. "The material is an excellent alternative to lacquered steel and is well appreciated for its efficiency of production and branding flexibility," says Tata Steel Duffel Site Manager Jan-Willem Vos. "The material was developed around the turn of the century and has gradually earned a substantial market share, especially since 2009."

Protecting against contamination

The success has had its downsides, however, as with increased production volumes some quality issues have emerged. "We found that the three-layer coating could have holes in some places, leading to a significant increase in the rejection rate at internal quality control, especially during the summer season," explains Vos. "Analysis showed that the problem was caused by various contaminants affecting the steel prior to coating. It could be tiny grains of sand, moisture or insects. We clearly had to find a way to better protect our production line from insects and other contamination sources."

“Quality is significantly better, because of the improved sealed setup, and cleaning and maintenance can be organised easily”

Searching for a workable solution

Tests were carried out using an auxiliary protective structure. Technical & Process Manager Peter Borremans elaborates: “We built a structure around the production line to sort of enclose the process. The rejection rate went down almost immediately to acceptable levels. This proved our case, but the solution wasn’t workable in the longer term because the structure had a negative impact on working conditions, requiring us to install extra lighting and take additional safety precautions. In addition, it made maintenance and cleaning much more difficult. So, what we needed, in fact, was a transparent structure that could be put up and taken down quickly.”

Drawing inspiration from concert tents

Borremans knew that he couldn’t develop such a sustainable solution without help. However, the search for a partner proved quite difficult. “Various companies put forward proposals, but they all fell short, mostly because installation and dismantling would be too cumbersome. But then TCS came up with their idea. They proposed to draw inspiration from concert tents, an area in which they had acquired valuable experience through their work with concert stage developer Stageco. TCS’s proposal convinced us, and so we worked closely together to design and develop this transparent, modular, lightweight, and easy-to-use protection system tailored to our needs.”

Amazing how well it works

Known as TEPE (Total Enclosed Protact® Environment), the system consists of a modular steel framework with transparent flexible plastic sheeting that can be installed and removed easily. 12 metres wide and 10 metres high, it protects the production line over a length of 40 metres, without unwanted side-effects. Borremans confirms: “Working conditions are much better than they were in the old set-up, with everyone having a perfect view over the entire process. Quality is significantly better, because of the improved sealed setup, and cleaning and maintenance can be organised zone by zone, leading to minimal production downtime. It’s amazing how well it works. I’m sure the solution will find its way into other production environments too.” ■

The system consists of a modular steel framework with transparent flexible plastic sheeting that can be put up and taken down easily. ▼





Steelworks

Ambition and the pursuit of excellence

New sports centre at the British School of Brussels

Theories about the benefits of sport and physical education have been put forward since the Ancient Greeks and Romans and still remain current in educational programmes (remember Juvenal's saying: "Mens Sana in Corpore Sano"). The British School of Brussels, a private school for the international community in and around the capital of Europe, recently reaffirmed this vision with the construction of their new sports centre. Jos Leysens of the architectural practice Licence to Build recounts how the project came about: "It is a story of ambition and the pursuit of excellence." ▶



KEY FACTS

- The new sports centre at the British School of Brussels reaffirms the importance of sport in education.
- Architectural practice *Licence to Build* seized the opportunity to improve the overall campus layout.
- The new building was awarded a BREEAM certificate with an 'excellent' rating.

▶ The structures of both the gym and the sports are based on HEB400 columns spanned by 33.4-metre inverted bowstrings.



The British School of Brussels (BSB) advertises itself as “a thriving, inclusive learning community for children aged 1-18”. It provides primary and secondary education to 1,350 children representing no less than 70 nationalities. The school is proud of its campus in Tervuren close to peaceful woodland, which in addition to classrooms, office space and workshops includes world class facilities for cultural education such as a theatre, a music recording studio and several libraries. And then there is the dazzling new sports centre, which was completed in 2016.

Improving site access and circulation

“Ambitions were high from the beginning,” says architect Jos Leyskens. “Sport and fitness are essential aspects of the educational programme in British schools. That’s why in 2010 BSB wanted to build an entirely new sports centre, much larger than the previous one and accommodating additional functions, including a swimming pool. They also wanted this new sports centre to be the campus hub. And it had to be state-of-the-art in every way, including with respect to sustainability criteria.”

Leyskens and his team at *Licence to Build* put forward a comprehensive approach, and developed a new master plan for the whole campus. “We shifted the site entrance towards the area between the existing theatre building and the new sports centre,” explains Leyskens. “This opened up opportunities to improve site access and circulation, including for cyclists and pedestrians. It also made the site more attractive while at the same time easier to protect against intruders.”

Bringing daylight into the gym

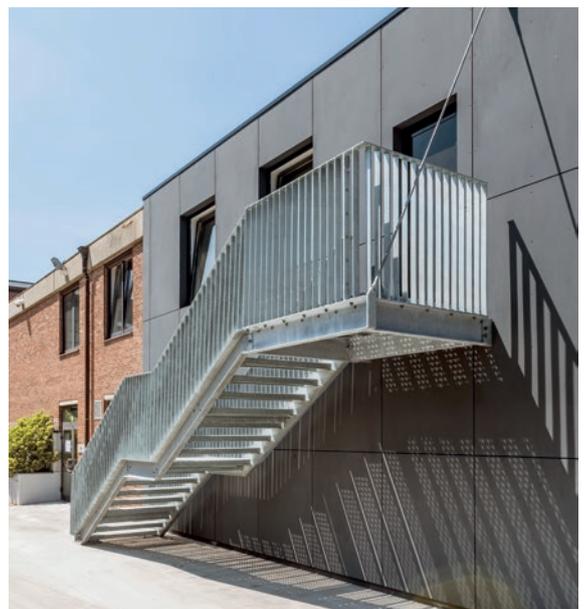
The sports centre itself includes a 25m swimming pool, dance studio, fitness suite, gym, and multi-purpose sports hall, as well as a cafeteria and a large examination space. Leyskens elaborates on the architectural challenges: “It is a fairly complicated cluster of different functions. For this reason, a fair number of the spaces were designed with a maximum functional flexibility to meet changing needs in the future. The building’s lightweight steel structure adds to the flexibility. At the same time, we also wanted to bring a lot of daylight into the gym and sports hall to improve comfort and reduce the energy needed for lighting. But this meant we had to avoid unpleasant shadows and glare, so we decided to use translucent wall panels to bring in diffuse light in a controlled manner. By the way, this also makes for a unique and elegant look from the outside!”



▲ The translucent wall panels bring in a lot of daylight and make for a unique facade.

“The lightweight steel structure adds to the building’s flexibility”

▼ The sports centre has been BREEAM certified.





▲ Daylight improves comfort and reduces the energy needed for lighting.

Named after Dr Jacques Rogge

Excellence was pursued and achieved in many ways, not least in relation to sustainability criteria. Leyskens: “The school board insisted our design met the highest sustainability standards. And we are indeed proud to say that the sports centre has been BREEAM certified, with an ‘excellent’ rating, the highest achievable rating for sports facilities. What’s more, BSB is the first school in Flanders to be awarded such a certificate” (see also ‘BREEAM for sustainable value’).

No wonder former president of the International Olympic Committee Dr Jacques Rogge did not hesitate to accept BSB’s proposal to name the building after him. With great pride, he officially opened it on 14 October 2016. ■

Specifications

TCS engineered, manufactured and built the steel structure of the gym and sports hall as well as the entrance structure and a number of steel stairways and passages.

- The main structure is a series of steel arcs based on pairs of HEB400 columns spanned by 33.4-metre inverted bowstrings.
- The inverted bowstrings are made up of a HEB400 (S355) top beam and a series of 219.1-mm CHS (S355) tubes.
- 250 tonnes of steel were used in the gym and sports hall, 17 tonnes of steel in the entrance structure.

BREEAM for sustainable value

BREEAM is the world’s leading sustainability assessment method for masterplanning projects, infrastructure and buildings. It addresses a number of lifecycle stages such as New Construction, Refurbishment and In-Use. BREEAM was launched in 1990 and continues to inspire developers and creators to excel, innovate and make effective use of resources. The focus on sustainable value and efficiency makes BREEAM certified developments attractive property investments and generates sustainable environments that enhance the well-being of the people who live and work in them (see also www.breeam.com).

At BSB, the extensive use of steel as the main construction material positively impacted the BREEAM score.



◀ The new entrance makes the site more attractive.

Make-over without interrupting operation

Renovating the reformer tower at Yara Tertre

The steel structure housing a crucial process installation at the Yara fertilizer production plant in Tertre is undergoing renovation. The structure, now more than 50 years old, was showing severe signs of wear, requiring a comprehensive make-over. But renovation has to be done while the plant is in full operation, which brings with it a number of tough challenges.

KEY FACTS

- The 50+-year old steel structure housing the Yara Tertre reformer is being renovated.
- A comprehensive measurement campaign and a structural analysis were carried out to identify the elements needing repair or replacement.
- Scenarios were developed to allow renovation while production continued.

The site at Tertre, near Mons in Belgium, was founded back in 1928, during the breakthrough years of the chemical industry. It was operated by different companies for several decades until 2007 when it was acquired and given a fresh boost by Yara. “We have been investing a lot since then,” says Yara Project Engineer Cyrille Cattray. “As you can see, the buildings here are quite old, as were some of the installations back in 2007. Most of our equipment is now state-of-the-art, but a number of buildings and process support structures still show signs of wear that need to be addressed.”

Poorly-documented structure

A lifetime assessment programme has been carried out on all the steel structures at the site. One of the structures under scrutiny was the 10m by 10m tower housing the plant’s primary reformer, a furnace that converts natural gas into gaseous hydrogen for the eventual production of ammonia. “Analysis revealed severe degradation and structural weaknesses, mostly resulting from the year-round exposure to aggressive substances in the ammonia production process,” says Cattray.

A budget was released to enable a thorough renovation, but the project faced some tough challenges. Cattray

The 10m by 10m tower houses the plant's primary reformer, a furnace that converts natural gas into gaseous hydrogen for the eventual production of ammonia. ▼

explains: "First, there were no detailed drawings of the original structure, which undoubtedly was put up more than 50 years ago. Presumably, additional equipment and elements had been tacked on to the structure over time, possibly compromising its strength and long-term reliability."

Detailed scenarios and procedures

For these reasons, TCS was called in to carry out a comprehensive measurement campaign, to clearly identify the weak spots and make a cost-effective proposal for renovation, indicating the parts needing repair or replacement. The project also needed to be carried out without the reformer being shut down. "Production continuity is of course of the utmost importance," says Cattry. "So, they developed scenarios and procedures to dismantle and assemble parts without disturbing the process. This involved temporarily attaching and securing cables and ducts as well as taking measures to comply with our stringent site safety standards."

"Procedures were developed to dismantle and assemble parts without disturbing the production process"

Rigorous execution and high safety awareness

At the time of writing, engineering and planning stages have been concluded, with most of the replacement parts manufactured. Tests are now being carried out on one level of the tower, allowing the scenarios and procedures to be finetuned where necessary.

The operation is not without risks, and that is why Yara has chosen to work with TCS as a partner. "They are equal to the task," Cattry elaborates. "High safety awareness and rigorous execution of tasks are indispensable in this type of work, and that is what they stand for. They have the organisation for it and they act accordingly. In addition, it is a great advantage that they combine high engineering skills with practical field expertise. They thoroughly support us during the entire process, including the preliminary analysis, engineering, planning, manufacturing, repair, and assembly. Communication lines are short and responsiveness is high. It's not easy to find such partners." ■



Specifications

- Dismantling and replacing steel structures in the tower, including 150 beams (25 tonnes).
- Removing and replacing 2 tonnes of staircases, 8.7 tonnes of stair and platform handrails and 382 m² gratings.

The final stage of the plan

Extending the beet washing line at Suiker Unie

Sugar producer Suiker Unie is coming to the end of its plan to significantly increase production capacity at the Dinteloord plant, between Antwerp and Rotterdam. The beet washing line extension is the final stage in a comprehensive masterplan to make the plant one of the most efficient, productive and sustainable sugar factories in Europe.

KEY FACTS

- The Suiker Unie sugar factory in Dinteloord, the Netherlands, is significantly increasing the capacity of its beet washing line.
- The project is the final stage of Suiker Unie's masterplan to prepare for the post-quota era of EU sugar production, making it one of the most efficient, productive and sustainable sugar factories in Europe.

The plan was initiated back in 2009, anticipating the end of quota management for EU sugar production on 30 September 2017. "Quotas have regulated sugar production for several decades, so putting a stop to that system will introduce a new dynamic to the market," explains project manager Jack Quist. "Factories will be allowed to increase production, which inevitably means that in the long term only the most efficient will survive. That's why we've been making a huge investment over the past few years to gradually modernise our plant and make it more cost-effective and sustainable."



▲ The extension of the sugar beet washing line is the final stage of the plant's modernisation plan.

The beating heart of the factory

The final stage of the plan is the extension of the sugar beet washing line, which at the time of writing is ongoing. “The washing line is kind of the beating heart of the factory, at least during what we call the campaign season, from September to January, when the sugar beets are harvested,” says Quist. “During the campaign, sugar beets are brought to the factory at an incredible pace. Incoming beets are carefully washed in several stages to remove the mud, stones, grass, leaves and other dirt. It’s a highly-automated process which must be carried out with great precision to make sure there is not the tiniest bit of dirt left.”

The current washing capacity at Dinteloord is 23,000 tonnes of beets per 24 hours, and the extension project will bring that number to 29,500. Top quality equipment has been developed for the purpose.

Tight tolerances and careful engineering

The civil engineering part of the project is equally challenging since it was decided to optimise the use of space by constructing additional accommodation around the existing building. “To preserve the old building, the steel constructor needed to carefully measure the existing structure to connect the new

“I was impressed how well organised they are in their steel workshop”

part,” says civil engineering staff member Wilfred Peters. “This had to be carried out while we were in the middle of our previous campaign. On top of that, the connection between the old and new buildings imposed very tight tolerances on the manufacturing process. And the design needed to be meticulously engineered, given the structural vibrations induced by the washing equipment. But I must say it all went very well. I visited the steel workshop in Houthalen and was impressed how well organised they are, and how closely the engineers and workshop people work together.”

Ready for the post-quota era

The project is planned for completion in the summer of 2017, ready for the next harvesting campaign starting in September. The completed masterplan will by then have turned the Dinteloord plant into one of the most efficient and sustainable beet sugar factories in Europe, with precisely organised input streams, highly automated processing lines, sustainable energy and water use, and 100% valorisation of the waste streams produced throughout the process. ■



◀ The design needed to be meticulously engineered, given the structural vibrations induced by the washing equipment.

Specifications

TCS designed, engineered and manufactured the steel construction of the washing line extension.

- 560 tonnes of structural steel, including 365 tonnes used in new structures and 195 tonnes in existing buildings.
- 11 tonnes of staircases, 1500 metres of handrails, and 2000 m² gratings.

The benefits of a fully equipped workshop

Oil skimmer renewed at the Total Refinery, Antwerp

In 2015, TCS renovated one of the two oil skimmers at the Total Refinery in Antwerp. The mechanical renovation of the 50-year-old equipment was carried out entirely at TCS's Houthalen workshop, under the scrutiny of Total quality control.

KEY FACTS

- One of the oil skimmers at Antwerp's Total Refinery was renovated to extend its useful life
- The mechanical renovation was carried out entirely off site to prevent interference with onsite activities

The two oil skimmers had been installed 50 years earlier as part of Total's wastewater treatment installation at their Antwerp refinery. They were designed to carefully skim the oil accumulating at the surface of two 30m x 6m wastewater basins so that it could be reinjected into the crude oil stream. Some years ago, one of the skimmers had broken down and was replaced by a completely new one, and this second one proved more resilient. Nevertheless, inspection revealed severe signs of wear and tear after its long period of useful operation, so a thorough renovation of both mechanical and electrical parts was due.



▲ The equipment was designed to carefully skim the oil accumulating at the surface of a 30m x 6m wastewater basin.

“All activities were carried out off site, including disassembly, manufacturing, conservation and assembly works”

Working off site

TCS was awarded the commission for the mechanical renovation, given their extensive expertise in working safely at Seveso sites, and for the demanding petrochemical industry. An essential aspect of the renovation proposal was that all work would be carried out off site, including disassembly, manufacturing, conservation and assembly, to prevent interference with onsite activities and avoid the risk of delays. The multipurpose workshop of TCS in Houthalen is fully equipped for such a task, since it includes the necessary hoisting equipment, a painting line and a test hall for disassembly and assembly.

Exactly as planned

The project was carried out exactly to plan. The skimmer was unmounted at Total on 17 February 2015 and transported in one piece to Houthalen where it was disassembled. Renovation work took two months and was monitored scrupulously by Total quality control staff. On 16 April 2015, they gave the green light for the skimmer to be assembled and transported to Antwerp for installation, in good time for the fitting of the electrical components. ■

Specifications

- Renovation of a 12-metre piece with a painting surface of 100 m² and approximately 24 m² of gratings.
- Stepwise approach, allowing for maximum re-use of material:
 - Disassembly of all parts.
 - Cleaning of all parts to allow inspection of transmissions, cables, bearings et cetera.
 - Sandblasting of the structure to lay bare the steel for inspection (deformation, corrosion, damage).
 - Renewing all worn-out parts.
 - Assembly at the workshop and transportation in one piece to the site.



◀ Renovation work was monitored scrupulously by Total quality control staff.

Solution to stand the test of time

Coil crane upgraded after incident

An incident involving a critical coil crane at ArcelorMittal in Geel (Belgium) led to severe damage to the equipment. Comprehensive expertise was required to deal with the aftermath, including providing a short-term remedy, identifying the root cause of the incident and developing a solution that would stand the test of time.

KEY FACTS

- A crane carrying out critical coil unloading at ArcelorMittal in Geel suffered severe damage from a collision with a gate
- An emergency repair was carried out, but analysis showed that a more comprehensive overhaul was necessary, including a redesign of the safety mechanism
- The crane upgrade was prepared and tested off site and subsequently installed in just three days.

The ArcelorMittal subsidiary ESP operates two plants in Geel, converting almost 400,000 tonnes of steel coils from the ArcelorMittal production plants in Ghent and Bremen to produce sheets and narrow band. “At ESP1, we have an average of two deliveries per week over water,” explains Maintenance Team Leader Johan Boeve. “They each involve up to a hundred coils, to be unloaded at our quay overnight, a process that takes up to eight hours.”

Disturbing incident

The coils are unloaded using a 32-tonne overhead travelling crane which runs from inside the storage building to above the canal. Unfortunately, the crane recently collided with the overhead gate, which was inexplicably locked in a half-open position. The event took Maintenance Manager Johan Boeve completely by surprise: “We were quite disturbed, not only because of the severe damage, but also by the fact that this incident could happen at all. The built-in safety mechanism should have prevented the crane from travelling, as the gate wasn’t completely open. Apparently, the mechanism didn’t work properly on this occasion.”

Problem identified and solved

Boeve immediately called in expert advice. “My first concern, of course, was to get the crane back in business for the next coil delivery. But I could also see that an in-depth analysis of what happened would be needed. That’s why I called on the expertise of TCS, with their combined knowledge of crane manufacturing, automation and industrial infrastructure. Their technicians were quickly able to get the crane working again, since the electrical system was still intact. But

they also showed us that the severity of the mechanical damage meant that a more radical overhaul was needed to prevent further wear and tear. Even more importantly, they identified a weakness in the original 2001 safety mechanism. This led them to propose a comprehensive system upgrade with state-of-the-art technology, including renewal of the crane PLC, replacement of the drives and damaged parts, and a redesign of the collision prevention mechanism.”

“We were quite disturbed, not only because of the severe damage, but also by the fact that this incident could happen at all”

Longer life expectancy

The new components were manufactured in the TCS workshop in Houthalen, where the new safety mechanism was also thoroughly tested. “I witnessed the tests, which went flawlessly,” says Boeve. “The same tests were carried out on site, after installation of the new components, which was completed in three days. It has worked very well ever since. And the new PLC and drives also make for smoother crane operation, which means longer life expectancy.” ■

Specifications

- 32-tonnes 23.5-metres overhead travelling coil crane
- Replacement of the complete electrical enclosures 2 x RITTAL TS 1200 x 1800 x 400
- Drives ABB ACS 850
- Schneider PLC TM 241
- Safety PLC PILZ PNOZ MULTI
- Improvement of interface with gate in building using a radio transmission of signals with HBC-radiomatic GEOX

◀ The crane’s PLC was renewed, the drives and damaged parts replaced, and the mechanism to prevent collision with the gate redesigned.



Giving onsite teams more control over their cranes

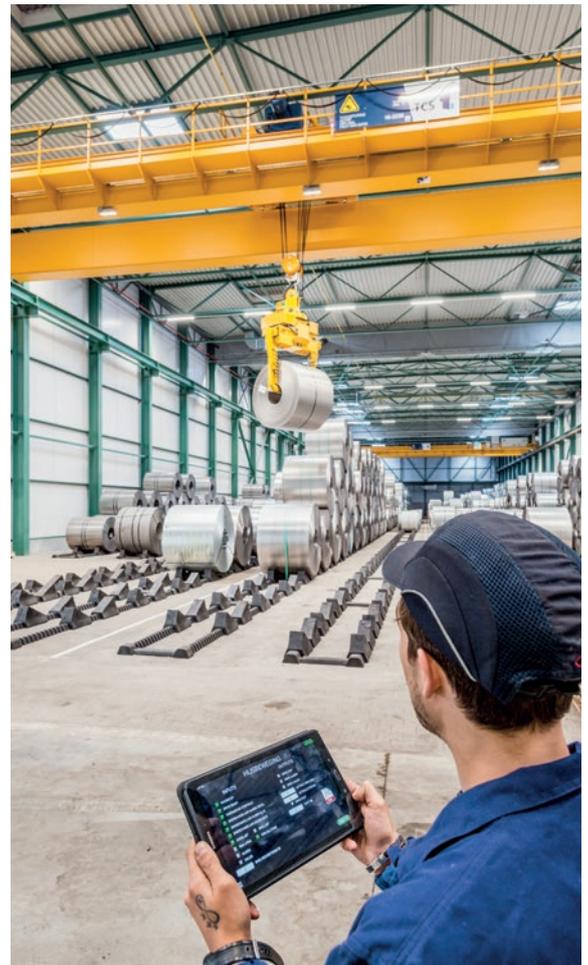
New tool from TCS enables onsite diagnostics

Last year, TCS developed a Wireless Crane Diagnostics (WCD) tool that allows onsite teams to quickly diagnose the most common crane issues. It is available for PLC-controlled cranes from any supplier or manufacturer.

KEY FACTS

- TCS has developed a tool to allow onsite maintenance teams to quickly diagnose possible crane performance issues.
- All diagnostic investigations can be made from below, without having to send someone up the crane.
- It improves efficiency and safety during both preventive and corrective maintenance.

The tool was developed to give customers more control over their crane fleet, especially when faced with a performance issue or other malfunction. “We started to think about this during talks with customers,” explains Carlo Grootaers, head of the TCS Cranes Business Unit. “Many of them have their own onsite maintenance teams, with the experience and skills to carry out most corrective interventions. However, they find that the diagnosis of problems is difficult and time-consuming. And they are right. For example, a lifting performance problem could be caused by a defective signal, a switching error or a frequency controller issue. It would require a maintenance person to get up onto the crane and check all the parameters to identify the cause.”



▲ All investigations can be made from below while operating the crane.

“The tool greatly eases inspection activities and diagnostics of problems”

Investigating while operating the crane

Grootaers and his team have therefore developed a tablet application which wirelessly connects with a Wi-Fi connector installed by TCS on the crane's PLC-controller. When launched, the tool immediately recognises all connectable cranes on the network. The user selects the crane to be diagnosed and the tool then lists all the relevant crane parameters, including:

- Status of all safety fuses and circuit breakers
- Status of all inputs, outputs and switches
- The actual motor currents
- Status of the drives

Crane parameters can either be checked when the crane is at rest or during crane travelling or trolley movements. “The WCD tool greatly eases diagnostics,” says Grootaers. “All investigations can be made from below while operating the crane, meaning that you avoid the hassle of sending someone up the crane with all the safety precautions that involves.”

Grootaers points out that the tool also improves efficiency and safety during inspections within the framework of preventive maintenance. And it also provides immediate access to the technical specifications and drawings of the crane system.

For more information on the WCD tool please mail sales@timmers.be ■



Safe Bulk Unloading Facility demonstrated

In June 2016, the Belgian association of safety, health and corporate social responsibility managers, Prebes, organised a site visit to the SABIC compounding plant in Genk. Members of the association were given a presentation and live demonstration of SABIC's new Safe All Weather Bulk Unloading Facility, developed and installed by TCS. Business Unit Cranes Manager, Carlo Grootaers, explained how the solution not only improves operational safety but also increases efficiency and user comfort.

For more information email sales@timmers.be.

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