



**BELGOPROCESS  
SUSTAINABILITY REPORT  
2020**

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BOARD OF DIRECTORS: Front: Mrs. Nele Roobrouck (director). Middle: Mr. Francis De Meyere (Managing Director) and Mr. Luc Mabilille (Vice-Chairman). Back: Mr. Geoffroy Blondiaux (director), dhr. Kris Vreys (chairman), Mr. Alberto Fernandez Fernandez (Federal Public Service Economy representative) and Mr. Wim Van Laer (General Manager).

# 1

Introduction

## 2020: Stable and flexible through the corona year

Dear reader,

**2**020, of course, was the year the coronavirus shut down the world. The measures also had a significant impact on the operational functioning of Belgoprocess. 'As a company with safety as its top priority, Belgoprocess weathered the corona crisis smoothly', say Kris Vreys and Francis De Meyere of the Board of Directors. 'We did experience limited delays, but our essential services were never compromised.'

As we do every year, we started 2020 by drawing up a plan based on four pillars: 1) Remediation of old waste, 2) Decommissioning of old installations, 3) Projects with focus on storage capacity and 4) Preparation of disposal. These four pillars are the starting point of our five-year plan for 2019-2023. This plan is in turn based on INSAP 1 and 2 (industrial and remediation plan for Sites 1 and 2) which outline the long-term vision that should prepare Belgoprocess for the challenges of the coming decades.

Then along came the coronavirus. In mid-March, the country went into lockdown and Belgoprocess also had to briefly suspend a number of activities and implement the corona measures in its operations. 'Our task is to protect society against the risks of Belgian radioactive waste', says Kris Vreys, Chairman of the Board of Directors. 'This waste originates mainly from our nuclear power plants and therefore continued to arrive at Belgoprocess even in coronavirus times. The safe receipt, processing and storage of this waste is an essential service. It was therefore a priority for Belgoprocess to reorganise in order to ensure unimpeded continuation of this waste treatment. Successfully so, because Covid-19 hardly had any impact on this process. The safety of the sites was also guaranteed at all times.'

## ADDITIONAL MANPOWER

Delays were more noticeable in decommissioning and remediation, but thanks in part to the recruitment of extra manpower, we were able to stay on schedule. This enabled us to embark on the dismantling works on the main building of Site 2 and on the mummy plant (the former bituminisation plant) (see p. 10, Remediation Plan Site 2), as well as the NOIR project (see p. 20, Processing of historical waste). For the processing of the containers holding radium (see p. 16, Processing of radium-containing waste) we are almost back on schedule. 'These radium-containing containers hold medium-level radioactive waste from the 1970s', explains Wim Van Laer, General Manager of Belgoprocess. 'Belgoprocess has taken on the responsibility to process and store this historical waste safely', adds Francis De Meyere, Managing Director. 'By switching to a three-shift system (morning, afternoon and night), we are stepping up our efforts to stay on schedule.'

In this particularly difficult year, we also managed to achieve some success. Chapter 5, for example, recounts the record time in which Building 151E (extension of the storage facility for conditioned short-lived low-level radioactive waste) was completed despite the coronavirus-related delay. This building gives us the necessary extra storage capacity.

A few years ago, we renewed our collaboration with NIRAS. In recent years this resulted in close cooperation between our purchasing departments (see p. 60, Purchasing departments). This efficiency exercise has an additional financial benefit.

## SAFETY CULTURE

Although the coronavirus had an impact on our operations, after a few weeks of lockdown we were able to restart without problem. The roll-out of our own corporate coronavirus approach went particularly smoothly thanks to the high level of safety awareness of our employees. In Chapter 6 you can read all about the safety culture at Belgoprocess. 'Belgoprocess is a company where in any case strict safety measures are in place', Kris Vreys explains. 'Our employees are familiar with those measures and are convinced that they are in the interest of everyone's safety. The same mindset exists on the factory floor towards the coronavirus measures. In any case, face masks and protective clothing have been a general safety feature at our sites for many years now. During the first lockdown, however, many hospitals were short of protective equipment.



Belgoprocess therefore donated its face masks and Tyvek suits (high-quality protective clothing) to hospitals in the area. A question of solidarity.'

## ENVIRONMENT & EXPERTISE

Belgoprocess not only carries a major social responsibility, but also an environmental one. 'It is our task to protect society against the risks of radioactive waste', Francis De Meyere explains. 'This also means that we want to limit our impact on the environment to a negligible level. We are working hard at this, and I want to emphasise this, because safety and the environment are closely linked, especially in our industry. I am therefore pleased to note that our emissions have remained well below the permit limits for many years (see p. 36, Environment). Our professionalism serves the environment.'

It is this professionalism that makes Belgoprocess a reliable partner worldwide. Our expertise in thermal technologies can today count on worldwide interest. In Chapter 9 you can read about the inventor's patents that Belgoprocess received for the PRIME pyrolysis installations and the tilting plasma furnace. 'As the successor of Eurochemic, Belgoprocess was at the very beginning of the nuclear era', Wim Van Laer says. 'Knowledge and experience have been built up here over more than half a century - knowledge and experience that we can market today. Why are we doing this? To stay up-to-date and in touch with the sector. Because if we do not keep investing in knowledge and expertise, this will slowly drain out of the company, and that would be detrimental to the sustainable operation of Belgoprocess. It is a way to preserve nuclear knowledge and know-how in the region. Knowledge and expertise feed the professionalism with which Belgoprocess fulfils its social role.'



Bart Ooms & Robert Walthéry

*'Careful long-term planning is essential.'*

Bart Ooms, Decommissioning Preparations Manager

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Decommissioning & remediation

# Remediation plan for Site 2 is in full swing

In 2020, Belgoprocess carried out a number of major decommissioning works and a permit application was prepared for the further remediation and decommissioning of Site 2. 'Our ambition is to quickly achieve a 'clean' site', Robert Walthéry and Bart Ooms explain. 'It's a long-haul project that sometimes throws up surprises, but we're on schedule and making systematic progress.'

INSAP 2 (Industrial and Remediation Plan Site 2) describes the long-term strategy for Site 2. The focus here is on eliminating historical waste batches (see p. 16 and p. 20, Processing of historical waste) and the remediation and decommissioning of the buildings and installations. A number of projects have already been completed in recent years, such as the decommissioning of the 270M and 270L arch sheds and the Evence Coppée incinerator. Other decommissioning projects on Site 2 followed, such as the Chaud, a building where radioactive liquids were stored until the 1980s. 'We started preparations for the decommissioning of the Chaud in 2013', says Bart Ooms, Decommissioning Preparations Manager. 'It's a particularly difficult decommissioning project. When we started the remediation work, it was filled to the brim with solid and liquid radioactive waste. It took us over two years to clean up this waste. It wasn't until 2015 that we started the actual decommissioning. First some equipment was removed such as pipes, pumps, lighting, etc., after which we started the decontamination of the outer walls of the tanks and the inner walls of the building. Robert Walthéry: 'Recently we also started decontaminating the inside of tank 9 with a remote-controlled demolition robot, as the radiation doses in the Chaud are far too high to send anyone in.' 'An additional problem is the stability of the building', Robert Walthéry, Decommissioning Operations Manager, adds. The weight of the roof is carried by the various tanks. 'Because the contamination has penetrated to the reinforcement of the concrete in certain places, the stability of the whole may be compromised when the contaminated parts are removed. Fortunately, we have found solutions for this, although this decommissioning operation will be quite a challenge in the next few years.'

#### Which projects were completed in 2020?

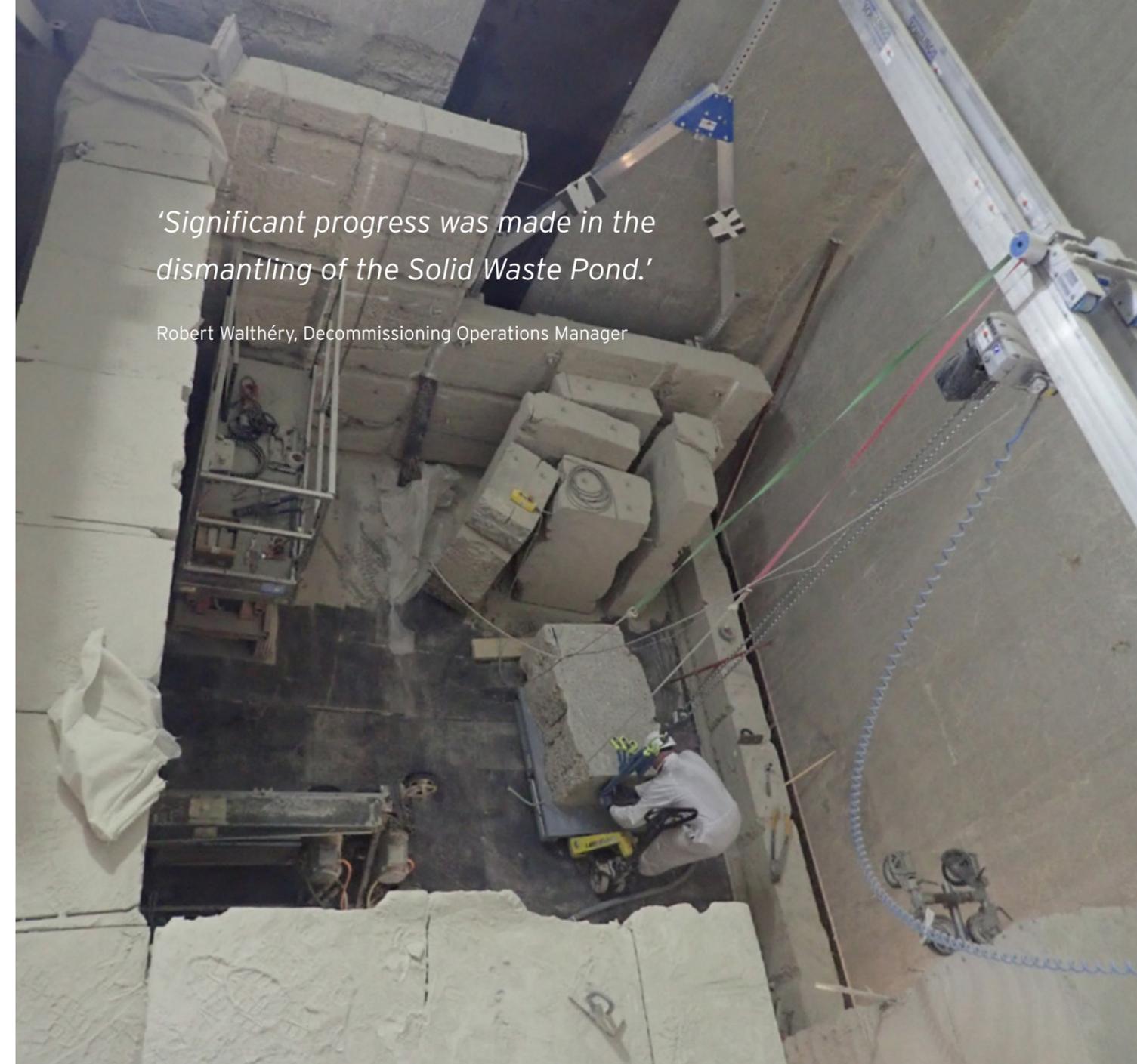
**Bart Ooms:** 'Last year we finished dismantling the pulsator room. In the 1980s, the liquid effluents of the former Eurochemic were treated in this location. The dismantling of this room was a major undertaking that started with drawing up a plan and a safety file. It took a long preparation because the pulsator room was built against the TRE (Treatment of Radioactive Effluents) and pipelines had to be moved. So we had to absolutely prevent both construction risks and further contamination. But we succeeded.'

**Robert Walthéry:** 'The dismantling of the outer tanks 234D, two decommissioned water collection tanks, began last year. For this purpose, the outer tanks were closed off with a roof and a new lock was built to allow access to the tanks. At this moment, the concrete decontamination works are in progress. We plan to demolish the tanks this year.'

#### What about the water treatment plant for low-level radioactive cold water?

**Bart Ooms:** 'As part of Belgoprocess's further modernisation, a feasibility project for a new water treatment facility on Site 1 is under way. A comprehensive study, for the possible relocation of the water treatment plant is connected with the discharge point and strict environmental legislation. For the next 10 years, the water treatment will in any case remain on Site 2.'

**Robert Walthéry:** 'We made substantial progress this year with the dismantling of the Mummy (the former bi-tuminisation plant). When we purify radioactive effluents, we first chemically bind the radioactive components. This creates sludge which settles on the bottom of the tank. After decantation, ultrafiltration and a thorough analysis, the process water is sufficiently pure to be discharged. The sludge, on the other hand, contains the radioactive waste. In the past, the sludge was treated by mixing it with bitumen, a petroleum-based liquid mixture. This mixture of sludge and bitumen produces a "mummified" end product, hence the name of the plant. Bitumen perfectly encapsulates radioactive waste, but has the disadvantage of being flammable. For



*'Significant progress was made in the dismantling of the Solid Waste Pond.'*

Robert Walthéry, Decommissioning Operations Manager

that reason, bitumen conditioning is being abandoned worldwide. Today, we treat sludge in the CILVA plant. The dismantling of the Mummy plant is well on schedule.'

**Robert Walthéry:** 'In 2020 we also started dismantling the alpha room of the main building on Site 2. A large part of the main building with the old laundry will thus be completely cleared and decontaminated. Demolition work will follow later. In addition, dismantling works were not only carried out on Site 2 but were also continued on Site 1. Significant progress was made in the SWP (Solid Waste Pond), the MTP (Material Treatment Pond) and the RP (Reception Pond) as well as in zone B with the dismantling of the alpha cells in Building 123.'

### What decommissioning projects are planned for the next few years?

**Bart Ooms:** Today we are preparing several decommissioning projects. We see the schedule as follows: in 2024 we want to tackle Building 250B, in 2025 we will start dismantling the Solarium, in 2026 it will be the turn of shed 250A and the FLK hall (location of the present concrete decontamination plant), and in 2027 we will start on the HRW (High-level Radioactive Waste) pits. Over the next few years, we will finish the projects that fall within the current five-year plan.

### The radium-containing waste at the Solarium is currently being treated (see p. 16, Processing of historical waste), but there are other historical waste batches too. Is that why the Solarium won't be dismantled until 2025?

**Bart Ooms:** 'Obviously the covered area of the Solarium has to be empty before we can dismantle it. The operating licence will then expire and the works will be carried out under a decommissioning licence. Obvious, but not always easy to plan for. Given the nature of the waste and the installations, we are sometimes faced with surprises that affect the timing and the budget. We closely monitor the progress of the processing of these waste batches on Site 2 and take this, as well as other risks, into account as much as possible when drawing up a safety report for dismantling.'

'Obtaining a decommissioning licence is a lengthy process. The final dismantling plan is an important part of this. An initial estimate of the dismantling cost and planning exists for all installations present on both sites, based on a chosen dismantling strategy. At this stage, therefore, there may be a greater degree of inaccuracy in the estimates. This information, together with a short description of the installations, can be found in the initial dismantling plan. As we approach the time of dismantling, this initial plan evolves into a final dismantling plan, with more accurate estimates. A final dismantling plan, in addition to a schedule and cost per project, also indicates which dismantling techniques we propose, which materials can be released unconditionally and which waste flows we expect, how many staff we want to involve in each project, etc. We submit this final plan to NIRAS for inspection. On the basis of NIRAS's favourable opinion on the final dismantling plan, we eventually submit a licence application with a safety report to the FANC (Federal Agency for Nuclear Control). The FANC thoroughly scrutinises the application, and Belgoprocess must justify the contents of this document before the Scientific Council for Ionizing Radiation. This is followed by a public inquiry with a public hearing for interested parties. Such a process can take three to four years, depending on the complexity of the installations to be dismantled. Careful long-term planning is therefore essential.'

### For what purpose will Site 2 be used once everything has been cleaned up and dismantled?

**Robert Walthéry:** 'The aim is to centralise all activities on Site 1 as much as possible and to reduce Site 2 to a limited radium site. All remediation and decommissioning projects will take many years still to complete.'



Building 235, Chaud



Pieter Vanbrabant & his team

*'With 20 people we are working day and night to process the radium-containing waste according to schedule.'*

Pieter Vanbrabant, team leader

# 3

Waste processing

## Additional manpower to process radium-containing waste

**B**elgoprocess geared up in 2020 with the processing of the radium-containing waste containers on Site 2. In order to tackle this complex, medium-level radioactive waste within the current five-year programme, Pieter Vanbrabant expanded his team fivefold and changed over to a five-shift system in May 2021. 'In this corona year, it was not easy to recruit and train extra people', Pieter Vanbrabant says.

Site 2 of Belgoprocess is the former waste department of the neighbouring SCK•CEN (Belgian Nuclear Research Centre). Waste batches for which there was no solution in the 1960's were stored here. In 1989, this waste department was transferred to Belgoprocess and renamed Site 2. Belgoprocess inventoried and categorised the waste on the Solarium and in the HRW (Medium and High-level Radioactive Waste) pits. The sorting and processing of this waste started in 2004. In early 2013, the company's objectives were focused on cleaning up its own sites and accelerating the elimination of these historical waste batches. 'Thanks to a clear schedule and a project-based approach, we have done a lot of work in recent years', says Pieter Vanbrabant, who, as team leader, is jointly responsible for the safe and professional processing of these waste batches. 'First, we thoroughly inspected the historical waste and divided it into three main categories: non-radium containing waste, sodium and sodium potassium waste and radium-containing waste. In 2016, we finished processing the non-radium and non-sodium containing waste. Two years later, in 2018, we finished the campaign with the sodium and sodium potassium waste (Na-Nak), after which we started on the most special waste, namely the radium-containing containers. If all goes according to plan, this waste will be processed by the end of 2023.'

#### If?

**Pieter Vanbrabant:** 'We have already experienced considerable delays in this project. That is also the reason why we will switch to a system with three shifts (an early shift, an afternoon shift and a night shift). The processing of the radium-containing waste is included in the current five-year plan 2019-2023. With four operators and one radiation supervisor, it was impossible to process this waste over two years. So an extra 12 people were put on this project. Five staff members came over from other internal departments, and an extra seven people were hired. Our team now consists of 15 operators and five radiation supervisors. With 20 staff members, divided over three teams working in shifts and two teams in normal daytime employment, we are literally working day and night to process the radium-containing waste according to schedule. So far, we have processed 54 of the 365 waste batches. Nevertheless, the timing is still tight. Especially as we are handling high-risk waste and safety is always paramount.'

#### What is causing the delays?

**Pieter Vanbrabant:** 'There are several reasons. Nearly ten years ago, we first separated the radium-containing waste from the non-radium containing waste. Thus we logically sorted radium-contaminated metals with the radium-containing waste. Meanwhile, however, the acceptance criteria for disposal have evolved and we have had to separate the metal from the other materials. So there are a lot of extra actions to be performed with hand manipulators and a telemanipulator, a kind of remote-controlled robot arm (high-strength manipulator). This is time-consuming precision work. With a remote-controlled robot arm we empty each container and sort the waste by waste type. This in any case takes more time than a manual process.'

'Another reason is the presence of radium in the radium-containing waste that decays to radon. Radon, a radioactive noble gas, also occurs in nature. In open air, radon gas dilutes very quickly, but obviously we work in enclosed spaces and that's where radon and its decay products hold risks.'

'Finally, there are the contents of the containers. This is historical waste for which waste accounts are very sketchy. We don't always know exactly what's in the containers, which sometimes leads to unforeseen circumstances that affect the planning. For example, we came across a number of drums containing lime. To handle this waste, we had to develop a special device. This, of course, took time.'



Jelle Van Limbergen, first proces operator

#### Did the coronavirus have an impact on the timing?

**Pieter Vanbrabant:** 'Corona did not cause an immediate delay, but did complicate the search for extra staff. Especially since these 12 additional employees had to be trained on site and the coronavirus measures apply here as well. It is also a highly varied training course: safety courses, transporting containers, cementing, welding drums, .... We press the sorted radium-containing waste, put it in OV200 drums (an overpack drum for 200-l drums) and cement the overpack. Then we seal the overpack. Once stored in the storage building, the potential pressure build-up caused by the radon gas is monitored individually in each overpack. Radium-containing waste therefore requires a specific approach and corresponding training. Not only for the seven new staff members with no nuclear experience, but also for the five people who were transferred internally and who have experience in handling these batches of radioactive waste. In the interest of safety, it is essential that all new people know the processing plant well and are able to react appropriately in the event of unforeseen circumstances. Our goal was to complete the training courses by September 2020, but the coronavirus prevented this. It wasn't until May 2021 that everyone was ready to change over to the five-shift system.'

#### Radium-containing waste is medium and high-level radioactive waste. From a safety point of view, wouldn't it have been better to process this waste first?

**Pieter Vanbrabant:** 'Radium has a very high contamination rate. If we were to process the radium-containing waste first, our plant would also become contaminated with radium. If we were then again to process non-radium containing waste in the contaminated facility, that waste would in turn become contaminated with radium. This is what we call cross-contamination. We would be creating extra radium-containing waste instead of processing it. For that reason, processing the radium-containing waste is only the final step.'



Thomas Huys & Robin Tuerlinckx

*'It takes 10 hours to make a drum disposable. Sorting, processing, characterising and preparing the waste accounts.'*

Robin Tuerlinckx, radiological characterisation engineer

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Waste processing

# Belgoprocess tackles historical non-conditioned waste

**B**elgoprocess started the NOIR project last year. This historical low-level non-conditioned radioactive waste will be treated for disposal in the coming years. 'It's a painstaking task, because little is known about the contents of these drums', Thomas Huys and Robin Tuerlinckx say in unison. 'We are talking about thousands of drums, each of which has to be transhipped, sorted, processed and conditioned.'

One of the main tasks in the current five-year plan is to handle the more than 2,500 drums of historical waste that are mostly in storage in Building 153. Since certain details about the contents of these waste drums are lacking, they have been waiting for conditioning for quite some time. The assignment is known as 'project NOIR' (Regularisation of Non-Conditioned Waste with Unknown Content).

Today, radioactive waste batches are sorted by activity and divided into three categories: solid incinerable waste, solid non-incinerable waste and liquid waste. This categorisation depends on the installation or technology used to process the waste. Incinerable waste can be reduced to ashes in an incinerator, liquid waste can be chemically treated, among other things, and non-incinerable waste is compressed with tremendous force. The purpose of this processing is volume reduction. A 200 litre drum of ashes or other waste is compressed under enormous pressure to form a flat disc up to 40 cm thick. These processed, compressed waste drums are then conditioned. To condition waste, Belgoprocess places the drums in a cement matrix that stabilises the waste and contains the radioactivity. This conditioned drum is then stored as a temporary solution, and disposed of after a period of monitoring and inspection (see p. 24, Storage).

## WASTE ACCOUNTING

'It takes 10 hours to make a drum of historical radioactive waste disposable', says Robin Tuerlinckx, radiological characterisation engineer. 'Admittedly, we are talking about the whole handling process: from sorting to processing and conditioning, plus performing analyses, checks and completing the waste accounts and other documents. Today we don't have enough information about these waste drums. We know that most of these drums are from the former Waste department of SCK•CEN (Belgian Nuclear Research Centre) and Eurochemic. This waste also dates mainly from the late 1980s and early 1990s. For the rest, we are left guessing about the contents of these drums. Measurements give us accurate information about the radioactivity of the drums, but to determine the chemical composition of the waste, we must open the drum and sort its contents so that the waste can be processed and conditioned in accordance with the current acceptance criteria for disposal. These criteria also require a digital waste accounting system. We want to do better than in the past and carefully document the contents of these drums so that future generations will clearly know what kind of waste is kept in the disposal plant. Besides an industrial component, our work also has an important administrative component.'

## 55 TONNES OF METAL

'The oldest drum we have handled so far dates from 1984', adds Thomas Huys, Manager of Production Management. 'Just two years before that, radioactive waste was still being disposed in the sea. The main criterion at the time was: the drum must sink. Just to show that the criteria surrounding waste have evolved tremendously since then. The NOIR waste dates from the first years after disposal in the sea was stopped. At that time, the criteria were more focused on operational safety and interim storage pending a final solution. There was a growing interest in surface disposal, although at the time that scenario was still a long way off. But as the concept of a disposal plant began to take shape, so did the criteria the waste had to meet for disposal. Particularly in the last 15 years, those acceptance criteria have become much stricter. Our task is to treat the NOIR waste until it meets those criteria and thus produce disposable waste. We have started sorting all the metals. It's a monumental task for which the entire NOIR team deserves nothing but praise. All the more so because they managed to release no less than 25% of the metal, or 13 tonnes, for recycling.'



Sorting metals (NOIR-project)

This means a considerable cost saving, because not only do we not have to condition this volume of waste, but we also do not have to reserve space in the disposal plant. This is a sustainable approach.'

## SHREDDER

Another challenge are the chemical disposal criteria. The limits for cellulose, chlorides and sulphates, for example, are particularly strict. 'We can remove cellulose from the NOIR drums fairly easily', Thomas Huys explains. 'It's a matter of carefully removing all organic materials such as wood, paper and cotton cloths. In order to determine the chloride and sulphate content, we started a test campaign whereby we installed a shredder in CILVA (Central Infrastructure for Low-Level Radioactive Solid Waste). We put the contents of a 200-l drum of NOIR waste into the shredder, which finely grinds the waste. An automated sampling system then takes about 100 fractions from the shredded waste. Because NOIR waste is radiologically very heterogeneous, a proportional sampling is done with a high number of fractions. This yields a representative sample of 200 grams. We then examine this sample in our lab for all relevant radiological and chemical parameters, also specifically for chlorides and sulphates. Of each drum we keep a second sample in case new criteria are imposed in the future. This is to avoid having to break open conditioned waste drums or monoliths in the future. We start this campaign with a demonstration phase in which some 200 drums of concrete waste are handled. This gives us scientifically valid and realistic data that will allow us to make a well-founded decision. After this efficient characterisation, we are confident that with the current approach we will be able to supercompact all the drums in CILVA (Ed.: the supercompactor is a press that compresses waste drums with a force of 2,000 tonnes to a flat disc) and store them in Building 151E (see p. 24, Storage) pending disposal.'



Maarten Houben

*'With Building 151E we are creating a buffer capacity for the next five years.'*

Maarten Houben, Reception and Storage Manager

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Reception and storage

**Belgoproces  
brings additional  
storage capacity  
into use**

**B**uildings 151E and 167X provide additional storage capacity on Site 1 of Belgoproces for low-level radioactive waste. 'Building 151E was realised in record time despite the corona crisis', Maarten Houben says with pride. 'In about three years from now, all ASR-affected packages will be confined in Building 167X. These two new storage modules provide additional storage capacity.'

Today, the low-level conditioned radioactive waste is safely stored in Building 151X of Belgoprocess, pending the commissioning of the surface disposal facility for category A waste by NIRAS. 'The building is full now, which meant that action had to be taken.'

## 151E

Belgoprocess and NIRAS had to look for additional storage capacity. 'When we started our search for a solution in 2018, an extension to Building 151X quickly proved to be the most realistic option', Maarten Houben explains. 'An extra storage building had the highest priority, because we wanted to avoid a capacity shortage at all costs. In other words: there was not much time, and an extension of the existing storage building saved a lot of time. Accordingly, Building 151E was created as an extension to 151X. We kept the design of this building simple, a concrete rectangle measuring 20 by 50 metres, so that we could complete the study work in 2019 and issue a public invitation to tender at the same time. Construction work began in September 2019. In order to facilitate the supply of the building materials, we constructed a new access road through the adjacent industrial site. We even moved the internal perimeter so that it no longer encircled the construction site (the internal perimeter is a security fence several metres high that separates the nuclear zone from the non-nuclear section). Putting construction workers and other people to work within the perimeter is no straightforward matter because of the strict safety requirements. All these measures ensured that the building could be brought into use at the end of 2020. A record time! We even made up for the time that was lost by the corona crisis. In less than a year, we have put up a building with concrete walls almost half a metre thick to shield the environment from the - albeit limited - radiation from the low-level radioactive waste. On top of that, 151E is equipped with a monitoring system to detect possible contamination, an overhead crane to stack the drums and a ventilation system to keep the humidity under control. We want to store the drums in the best possible conditions.'

## ASR-AFFECTED PACKAGES

Building 151E has room for an additional 5,000 drums. This extension creates a buffer for the next five years. In the meantime, Belgoprocess and NIRAS are preparing the construction of another new storage building, 167X. Last year, Belgoprocess acquired the nuclear and environmental permits for this building. Building 167X is specifically intended for ASR (Alkali-silica reaction) affected packages. These drums were produced by the Doel nuclear power station. ASR is a chemical, not radiological, reaction which occurs when concrete or mortar components react with each other, namely alkalis present in the pore water and reactive silicon. In such a reaction, a gel-like substance is formed on the concrete or mortar which, when dry, leaves a white deposit. Such an ASR reaction also occurred in a number of those waste drums from Doel. This is because mortar is poured into the drums to stabilise the waste. 'The ASR reaction has nothing to do with the low-level radioactive waste, but with the origin and reactivity of the concrete or mortar components', Maarten Houben stresses. 'Even without the radioactive waste, gel formation would have occurred on these drums. These drums do not pose any additional threat to humans or the environment, but their condition does not meet the criteria imposed. Therefore we plan a new building in which we can isolate the ASR-affected packages and store them safely.'



Storage building 151E

## PYRAMID

'These drums are currently in Building 151X in a separate stack created for that purpose', Maarten Houben continues. 'We are talking about approximately 5,000 drums, and given the congestion in Building 151X, monitoring these drums is not so easy. In 151X, the drums are stored like a pyramid because of the stability of this construction. For that reason we also maintain this pyramid stacking in 151E. However, when an ASR drum is at the bottom of the pyramid, we have to move a large number of other drums in order to inspect that one drum. This is not efficient. In Building 167X, the affected packages will be placed vertically per four drums in a metal rack which will make it much easier for us to monitor and isolate the drums. For a closer inspection we can transport a rack with four drums in its entirety to a specially equipped inspection room in Building 167X. In this separate area, further analyses can be performed on those particular drums. An ASR reaction can cause the drum to bulge. We can avoid this by removing the gel in time. In Building 151X this is quite an undertaking now, but in Building 167X there is sufficient room for manoeuvre to carry out this and similar interventions easily and efficiently. Incidentally, these ASR-affected packages are waste drums that were processed and conditioned by manufacturers. Since CILVA became operational, Belgoprocess has had a conditioning method that is ASR-proof. So it's not like the gel drums keep piling up in 167X. And as we remove these ASR-affected packages from Building 151X, we will create additional storage space here too in a few years while waiting for the surface disposal facility. The completion of Building 167X is scheduled for 2024.'



Building 151E: additional storage capacity for 5,000 drums



Michaël Maes

*'Thanks to our safety culture, we were very quickly able to roll out our own coronavirus approach.'*

Michaël Maes, Operational Safety Manager

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Safety survey

## Safety culture is stronger despite corona

**B**elgoprocess organised a safety survey among its staff in 2020 for the third time. This survey is the barometer of the safety culture. 'The fact that our employees awarded a higher score to safety at Belgoprocess in this difficult coronavirus year is very encouraging', says Michaël Maes of the 'Think Differently, Act Differently' working group.

How do employees and other stakeholders experience and perceive safety at Belgoprocess? To answer that question, in 2016 Belgoprocess conducted the first ever survey that captured the safety perception of all stakeholders. Since then, the working group 'Think Differently, Act Differently' has repeated this safety survey every five years for external stakeholders such as NIRAS (National Agency for Radioactive Waste and Enriched Fissile Materials), the FANC (Federal Agency for Nuclear Control) and the local authorities of Mol and Dessel. Since 2019, the company's own staff have even been asked each year about Belgoprocess's safety policy. In the coronavirus year 2020, 390 of the 550 employees, or over 70%, participated in the survey. They were presented with 45 statements to which they could assign a score from 1 to 5, from totally disagree to totally agree. 'Safety perception received an average score of 76%', says Michaël Maes, Operational Safety Manager and member of the 'Think Differently, Act Differently' working group. 'That's an excellent figure in itself. Compared to last year, we're even up 3%.'

**In recent years, Belgoprocess has invested a great deal of effort in the area of safety culture. Examples include programmes such as 'Think differently, act differently' and 'Ten for Safety'. So isn't 3% progress a meagre result?**

**Michaël Maes:** 'The aim of this safety survey is precisely to find out to what extent our efforts are paying off. 3% growth since last year and 5% compared to 2016 may not seem like much, but it is progress and frankly I didn't expect it. The coronavirus has severely curtailed our activity. Initiatives such as 'Ten for Safety' and our annual nuclear safety training have even been completely reworked into an online platform with videos, quizzes, multiple choice tests, etc., because at this moment you cannot bring dozens of people together in a room. So, despite all the coronavirus restrictions, we as a working group have continued to put a lot of time and effort into further rolling out safety projects. Precisely because a good safety culture can quickly disappear while it takes years to gradually build up. The fact that we are seeing this steady progress reflected in the figures is a very positive sign for me.'

'Especially as we had also provided space for additional comments in the questionnaire. Many employees used this space to express ideas or give a thumbs up, but they also wrote down their concerns and (constructive) criticism. This shows openness and commitment, which is necessary for a stable safety culture.'

**A lot of those comments were about communication. The 2019 Satisfaction Survey also noted this as an action item.**

**Michaël Maes:** 'True, and while we can't make an action item out of every comment, we certainly need to work on communication. Although the criticism is somewhat biased. For example, some employees perceive a lack of information, even though the information is actually available. Others complain there is too much information. Especially in this corona crisis, employees have been receiving a flood of emails about measures and adjustments. I believe that a plan of action needs to focus on two fronts: better streamlining of communication on the one hand and better filtering of information on the other.'

**All employees were presented with 45 statements. No statement received a lower score than in 2019. The score remained the same for just three statements. Conclusion: support for the safety culture is stable.**

**Michaël Maes:** 'A safety culture is never finished. It will never be 100%. Moreover, safety culture does not exist in isolation, with its own goals and distinct expectations. Instead, the safety culture reflects the impact of the corporate culture on safety. To make it sustainable, it needs to be worked at permanently. For example, in response to the statement that Belgoprocess considers safety very important, over 75% either totally agreed or agreed, which is a good score. In response to the statement that Belgoprocess only works safely,



Elise Lemaire, Safety Supervisor

this figure dropped to approximately 50%. We take this result to mean that our employees still perceive a difference between theory and practice. So, despite the fact that we have been working on this for years, it is still a great challenge, and we will have to go back to the drawing board. The 'Think Differently, Act Differently' working group will also first examine the statements that received the lowest scores in the survey.'

**For example, regarding cooperation between the various departments?**

**Michaël Maes:** 'For instance. It is also our impression that certain scores and/or comments are very department-specific and should not be interpreted company-wide. Although we do not know that for sure, since the survey is conducted anonymously. Next year we would like to collect some additional data from our participants - without obligation - such as department and years of service. We can imagine that someone new in an administrative position will experience the safety risks very differently from an experienced operator. By matching data such as department and years of service with the scores, trends will become more visible and allow us to formulate action items in a much more targeted way.'

**A separate coronavirus section was added to last year's safety survey. Were the coronavirus measures easily accepted?**

**Michael Maes:** 'An employee said it like this: 'Working at Belgoprocess is an advantage in coronavirus times, because we have long been used to dealing with contamination.' He is referring, of course, to radioactive contamination, but it is true that the measures we have been applying for years to prevent exposure to radioactive contamination overlap with the coronavirus measures. Face mask, Tyvek suit and hand washing are familiar means of protection here. Furthermore, our employees are well versed in working under strict safety arrangements and measures because these are typical of our sector. I therefore firmly believe that our shared safety culture and the individual safety awareness of our employees ensured that we were very quickly able to roll out our own coronavirus approach with shifted working hours, adjustments in the offices, extra protective equipment, etc. Our employees deserve praise for this.'



Bert Claes, first operator



Sandra Vanarwegen

*'As a company with a major social responsibility, the environment gets our full attention.'*

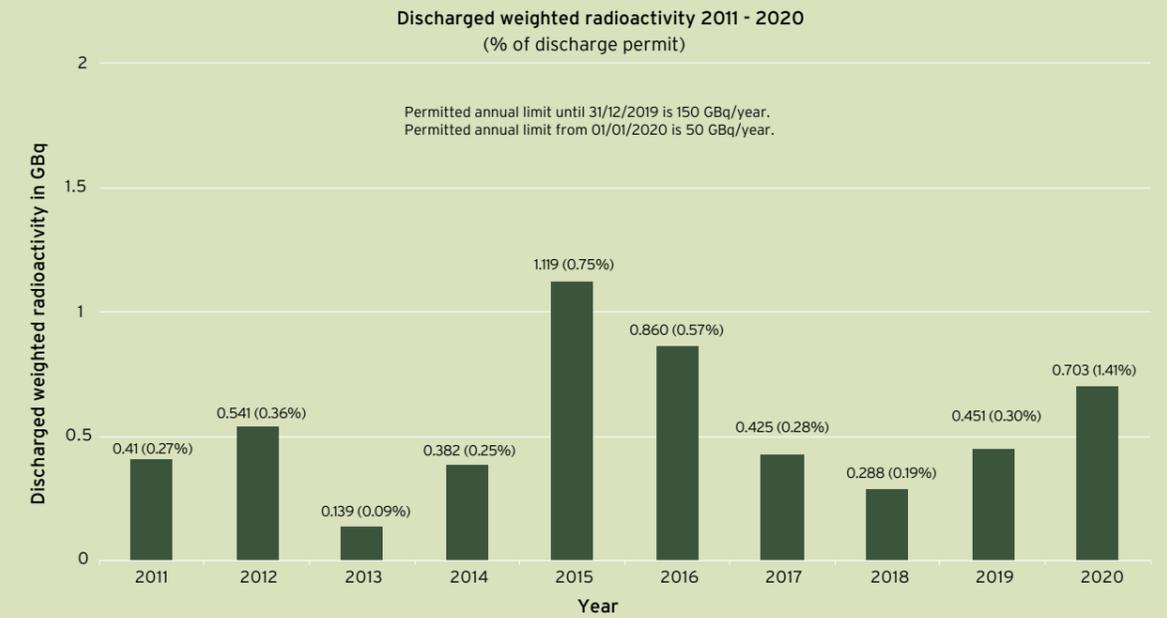
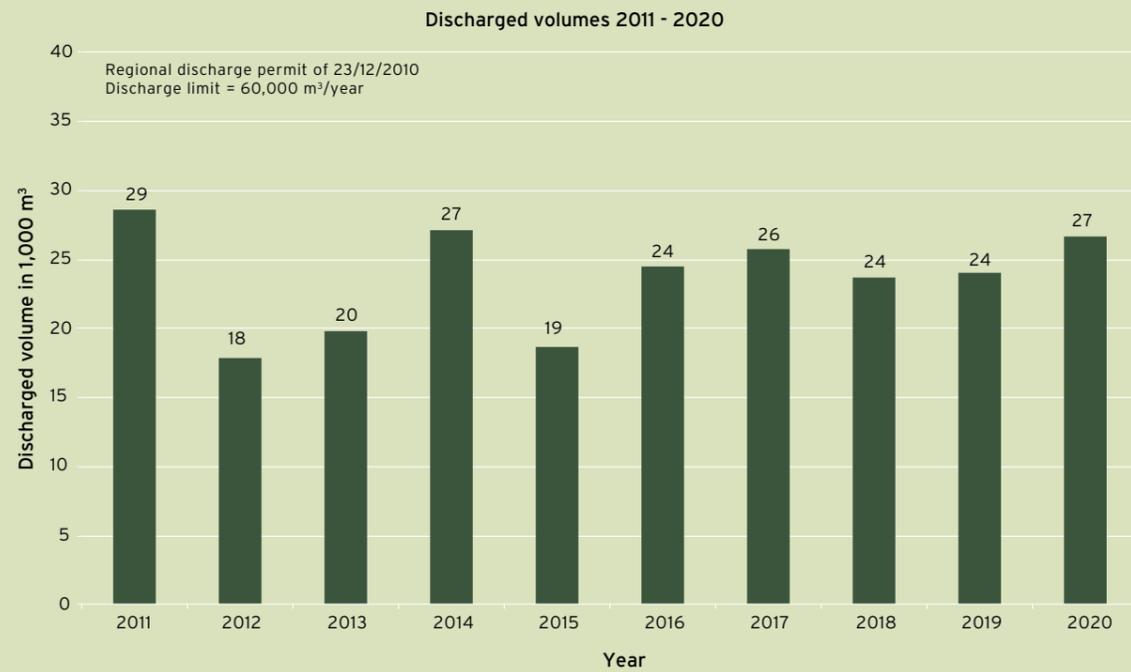
Sandra Vanarwegen, environmental coordinator

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Environment

## The environment as long-term vision

**B**elgoprocess continuously strives to reduce the environmental impact of its operations in a responsible manner. This environmental policy is based on a quality system in which safety and care for the environment are inextricably linked. An approach that pays off, because for many years now the discharges from Belgoprocess have remained far below the legal limits.



Belgoprocess's priority task is to protect society from the hazards of radioactive waste flows. Translated into daily operational terms, this means that safety and environmental care are the guiding principles throughout all activities. A sophisticated environmental monitoring programme oversees the radiological impact of the company's activities on the environment. This monitoring programme consists of the radiological monitoring of water and atmosphere at Sites 1 and 2 and in the surrounding area.

## WASTEWATER

Belgoprocess distinguishes two kinds of industrial wastewater: nuclear and non-nuclear wastewater. After a phased purification process and multiple analyses, the wastewater is discharged into the Molse Nete. In 2020, a total of 26,656 m<sup>3</sup> purified industrial wastewater was discharged into the Molse Nete. This is less than half the permitted volume (60,000 m<sup>3</sup>/year). The associated weighted radioactivity amounted to 0.703 GBq (Gigabecquerel) or barely 1.4% of the (new) permitted annual limit, namely 50 GBq. Moreover, these low discharge volumes are not exceptional. 'Over the last 10 years, the figures for liquid discharged effluents have been more or less constant with an average volume of 24,000 m<sup>3</sup> per year and an average weighted radioactivity of 0.500 GBq', Sandra Vanarwegen, environmental coordinator at Belgoprocess, explains. 'Last year, the volume discharged did increase slightly because more waste was processed at CILVA (Central Infrastructure for Low-Level Radioactive Solid Waste) resulting in more washing waters.' The total weighted amount of radioactivity discharged in 2020 has also increased. This is primarily due to the application of a new discharge formula for liquid discharges into the Molse Nete with other isotopes and other weighting factors (applicable from 1/1/2020). The dose impact on local residents (annual dose) resulting from these liquid discharges amounted in 2020 to 0.666 µSv (microsieverts). Since the legal limit is 1 millisievert or 1,000 µSv on an annual basis, this dose impact is negligible.

## ATMOSPHERIC EMISSIONS

For many years now, Belgoprocess has been making significant efforts to limit its emissions into the atmosphere. This is done mainly by using advanced filtration with pre- and absolute filters and by applying gas scrubbing. The absolute filters (HEPA or High Efficiency Particulate Air filters) are highly efficient and retain at least 99.95% of the dust particles in the air. In recent years, the various permitted chimneys at Sites 1 and 2 have emitted only a minimal fraction of the permitted limits. These emission limits are determined per isotope (alpha, beta, radon and tritium) and per chimney. 'In 2020, a total of 0.65 MBq (α and β aerosols, excluding tritium and radon) was discharged from the chimneys at Sites 1 and 2', Sandra Vanarwegen explains. The central chimney at Site 1, Building 120 with a height of 80 meters, remains the main discharge point. At both Site 1 and Site 2, atmospheric emissions are significantly below the emission limits. Last year, we discharged a maximum of 1% of the permitted limits, with the exception of the radon emissions from the chimney of Building 280. At 48% of the permitted limit, the radon emissions from this chimney were still within expectations. Since the processing of radium-containing waste from the Solarium has begun (see p. 16, Waste Processing), these emissions will continue to decrease over the next few years.'

The dose impact on the environment from these atmospheric discharges is again negligible. For example, the total dose received by the most critical person in 2020 was 10 µSv (microsievert), while the legal maximum dose is 1 mSv (1 millisievert = 1,000 µSv).

## SOLID WASTE

Solid waste flows primarily originate from the decommissioning and remediation activities at the sites as described in INSAP 1 and 2 (Industrial and Remediation Plan for Sites 1 and 2). These activities generate large volumes of materials, mainly concrete rubble and scrap metal. Thanks to an extensive material management programme and specially designed installations, Belgoprocess succeeds in eliminating all radioactive contamination from most of the concrete rubble and/or scrap metal. The concrete can then be released for recycling in road construction. The decontaminated metals can also usually be released again after sampling and measurement. This means that Belgoprocess only discards radioactive waste if recycling is not technically or economically feasible. This radioactive waste is analysed, characterised and processed, conditioned and stored on site using the most state-of-the-art techniques, ready for disposal.

## DOUBLE LICENCE

Belgoprocess is double-licensed (federal & regional). In addition to the nuclear operating licence, Belgoprocess has an environmental permit for the existing conventional installations on both sites. For example, Belgoprocess has two permits for discharging industrial wastewaters into the Molve Nete: a regional permit (from the province) for the physico-chemical parameters and a federal permit (from the FANC) for the radiological parameters. 'As a company with a major social responsibility, we take the environment seriously', says Sandra Vanarwegen. 'The safety and health of our employees and local residents, and especially also the protection of the environment, are our absolute top priorities. After all, these priorities are inspired by Belgoprocess's policy. In our industry, safety and the environment are, of course, closely linked.'



The Belgoprocess discharge point in the Molve Nete



Ken Goeyvaerts

*'The cabling on Site 2 was a tangle. The new building bundles all the electricity so that the decommissioning projects can be carried out safely.'*

Ken Goeyvaerts, expertise manager electricity, instrumentation, automation

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Projects

## New utilities for further modernisation

**B**elgoprocess is preparing for the future. Whereas on Site 1 investments are mainly planned in new installations and buildings, Site 2 is being remediated and decommissioned on a project basis. Since those activities require a lot of energy, Belgoprocess built an additional electricity substation on both sites. 'On Site 1 we need electricity for the new buildings', Ken Goeyvaerts says. 'On Site 2 to keep the decommissioning projects running safely.'

Belgoprocess currently comprises two sites where radioactive waste is processed and stored. However, with a view to greater efficiency, we plan to concentrate all activities at Site 1. In order to be fully prepared for these future challenges, both from an organisational and safety point of view, the centralisation of activities is the most important principle. This is all outlined in INSAP 1 & 2 (Industrial and Remediation Plan for Sites 1 and 2). In concrete terms, this plan involves the remediation and decommissioning of Site 2 on the one hand and the further modernisation of Site 1 on the other. In recent years, considerable investments have already been made on Site 1. Take for instance the upgrading of the PAMELA installation and the CILVA, the construction of a multifunctional security station, the installation of an internal perimeter, etc. Last year, storage building 151E also became operational and a start was made on Building 167X, also for storage (see p. 24, Storage). 'Building 151E is equipped with a ventilation system, a monitoring system and an overhead crane to stack conditioned drums', manager Ken Goeyvaerts explains. 'A lot of equipment will also be installed in Building 167X, such as a conveyor belt that picks up the drums in Building 151X. These new buildings must therefore be supplied with electricity. We investigated whether we could obtain this power supply from other buildings, but strategically a new substation proved to be a better solution. Firstly, because extending the power supply from other buildings on Site 1 would be detrimental to later decommissioning. Secondly, because in the vicinity of these new storage modules, a number of other projects are planned in the next few years that can also be connected to this electricity distribution point.'

## BUILD TO DISMANTLE

On Site 2, INSAP mainly describes remediation and decommissioning projects. The centralisation vision requires the phasing out of Site 2. Here too, much progress has been made in recent years (see p. 10, Remediation Plan). 'During the preparations for a series of decontamination and dismantling works, the power supply increasingly became a vexing issue', Goeyvaerts continues. 'Site 2 dates from the 1950s, and so do many of the utilities. Naturally, innovations, improvements and extensions have been made over the years, but mostly within the existing cable trajectory, and that is a huge tangle. Knowing how the cables run and where they are connected required more and more detective work. In order to concentrate all the wiring, we also installed a new utility building here. It saves time and allows us to work more safely. When we dismantle a building, we shield it as much as possible from the other activities on the site. Until recently, however, we still had to branch off power from another building; today we no longer need to make those connections. Most of the electricity for the dismantling works is supplied from one building so that we work in an isolated circuit. In short, we have built extra in order to dismantle. This seems contradictory, but it was the most effective solution. Logically, therefore, this electricity substation will be the last building we demolish on Site 2.'



Bart Verwimp, electricity and utilities technician



Jorden Van Genechten, electricity and utilities technician and Kristof Isenborghs, technical manager electricity

## EARTHQUAKES

'On Site 1, the building had to be put up inside the perimeter (Ed.: the internal perimeter is a security fence several metres high that separates the nuclear zone from the non-nuclear part). This made construction work more difficult, which has an impact on the cost. Yet the special technical requirements in particular weighed on the cost. These are not 'conventional' electricity substations, but high-tech buildings that help ensure the safety of radioactive waste storage. On Site 1, the building had to be designed seismically because of the requirements for the emergency generator, which had to be earthquake resistant. For Site 2, this was not a requirement because this electricity substation will be demolished again once all remediation and decommissioning projects are finished.'





Jurgen Hansen

*'Belgoprocess has the experience and know-how to help roll out the most sustainable waste processing solutions worldwide.'*

Jurgen Hansen, International Business Development Manager



Commercial

## Worldwide interest in thermal technologies

**T**he coronavirus has caused some delay, but there is no doubt that we will be marketing our thermal technologies in the coming years', says Jurgen Hansen, International Business Development Manager at Belgoprocess. With PRIME and tilting plasma technology, Belgoprocess has two innovative techniques to process radioactive waste in a sustainable manner. This expertise can count on worldwide interest.

In November last year, Belgoprocess, together with the Dutch mechanical engineering company Montair Environmental Solutions, received two patents for their mobile pyrolysis installation called PRIME (Pyrolysis Resins In Mobile Electric installation). The inventor's patents were granted for the reactor and the oxidizer of the plant. Pyrolysis is a thermal technique in which (radioactive) waste is heated in an oxygen-free environment to produce a mineralised end product.

## STABLE END PRODUCT

'Pyrolysis is in fact a fairly simple technique that Belgoprocess has been using on the site since 1999', Jurgen Hansen explains. 'However, over the past few years we became convinced that there is a lot of future in this. Especially on account of the type of waste we can process with pyrolysis, namely medium-level radioactive resins from the purification circuits of high pressure reactors. The heat generated by fissile materials in nuclear reactors is absorbed by water. This reactor water is systematically purified by resins. From time to time, however, the resins themselves have to be replaced. The old, saturated resins are then logically processed as radioactive waste. In many places they are stored in special containers or are processed by homogeneous cementing. Pyrolysis is the ideal solution for the storage of resins. After pyrolysis, all that remains of the resins are small graphite-like granules in which the radioactivity is trapped. This not only means a huge reduction in volume by a factor of 7 to 8, the carbonised end product is also inert and suitable for disposal.'

## CANADA

As a process provider, Belgoprocess co-invested in a mobile, electrically powered installation that is easy to transport and excels in ease of use and maintenance. International interest was not long in coming. 'In the meantime, a partnership has been entered into with a Canadian company for the implementation of a PRIME installation', Jurgen Hansen reveals. 'Although the coronavirus has complicated matters, construction will begin this year, with Belgoprocess again acting as process provider and Montair Environmental Solutions taking on the actual construction. Once PRIME has been implemented there, we venture to assume that other countries will follow Canada's example. PRIME has been extensively tested for over six months and has delivered excellent results, but in our industry companies prefer not to be the first to implement a new technology. However, I am confident that the industry will soon be convinced of the added value of PRIME. Especially as the installation is small, mobile and affordable. In addition, Belgoprocess is currently conducting additional tests to determine what other type of waste can be processed in PRIME. We may therefore be able to market PRIME more widely. That is if the tests unequivocally show that there are no risks involved in processing waste other than resins. Belgoprocess stands for safety and contributes to sustainable solutions. Belgoprocess dares to take the lead in this field. Although the two patents do not relate to inventions that will soon be mass-produced, they do show that Belgoprocess is still at the cutting edge of nuclear innovation.'

## TILTING PLASMA FURNACE

In 2013, Belgoprocess also received an inventor's patent for a component of another thermal technology, plasma incineration. Plasma incineration is incineration at exceptionally high temperatures, up to 1500°C. This is not a new technology, but Belgoprocess has optimised the plasma furnace with a tilting mechanism so that molten waste can be poured into steel drums more efficiently and safely. The waste then hardens into a chemically highly stable slag, ready for direct disposal. 'As with PRIME, the stable end product is one of the major strengths of plasma incineration', Jurgen Hansen explains. 'After incineration, there is no organic material left. The slag is a dead end product that no longer reacts with the environment and therefore meets the strictest acceptance criteria for disposal. And plasma incineration has another major advantage. Almost everything burns or melts at a temperature of 1500°C. In a plasma furnace, all kinds of mixed waste can be processed simultaneously without prior sorting. This is obviously the ideal solution for problematic and complex historical waste batches.'

## INTERNATIONAL INTEREST

In 2016, Belgoprocess, together with the Spanish engineering firm Iberdrola, built the first tilting plasma furnace for the Kozloduy Nuclear Power Plant in Bulgaria. After two years of testing and another two years to process a contractually stipulated minimum volume of waste, the plasma furnace was successfully delivered last year. Interest from other countries has only increased since then. 'There is definite interest from the Netherlands, among others, and various discussions with China were started some time ago', Jurgen Hansen explains. 'Under normal circumstances we would have already travelled to China a few times, but the coronavirus threw a spanner in the works. China will build a plasma furnace, albeit with delay, and is keen to get hold of Belgoprocess's expertise and know-how, after which other countries may follow. Countries around the world are confronted with historical waste batches that are still stored according to practices that fail to meet the ever stricter criteria. Plasma incineration is the best solution because it requires no pre-sorting of the waste and still produces an extremely stable end product. Furthermore, the volume reduction factor of plasma incineration is very high. This is an enormous gain, because space for waste storage and disposal is a precious commodity. With support from the energy transition fund, Belgoprocess carried out a feasibility study for the construction of a plasma furnace on its own site. It's a realistic option, yet the financial and organisational possibilities need to be looked at thoroughly.'

'Business Development is now primarily looking to market our expertise and experience in thermal technologies', Jurgen Hansen stresses. 'In the coming years, Belgoprocess wants in particular to play its role as process provider. With the PRIME and tilting plasma technology we have the know-how to help roll out the most sustainable waste processing solutions worldwide.'

'Besides these commercial assignments, we want to continue especially to play our role as a social service provider. Last year, for example, we started dismantling the former Best Medical nuclear site in Fleurus, together with Tecnubel and SCK.'



PRIME installation  
**Dosing Unit**

PRIME installation  
**Pyrolysis Reactor**

PRIME installation  
**Thermal Oxidizer**

PRIME installation  
**Scrubber**

Pyrolysis Resins in Mobile Electric installation (PRIME)



Dr. Hilde Bertels, head of the SCK•CEN medical team

photo © SCK•CEN

*'The annual doses that Belgoprocess employees receive are very low.'*

Dr. Hilde Bertels, head of the SCK•CEN medical team

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HR/Staff

## Medical team praises safety and health awareness of Belgoprocess employees

**T**he efforts made by Belgoprocess in terms of safety culture have a direct and positive impact on my work', says Dr. Hilde Bertels, who is responsible for health surveillance at Belgoprocess as occupational physician of SCK•CEN. 'The severity and frequency of work accidents at Belgoprocess has been remarkably low for many years, and the coronavirus efforts have been kept up well too. The resilience of the staff is commendable.'

In Belgium, companies and institutions that use radioactive substances are divided into three classes. This classification is based on the potential risk of the operation. Belgoprocess is a Class 1 nuclear facility. Class 1 companies are subject to the most far-reaching licensing procedures and the strictest safety requirements. The protection of workers against ionising radiation is also extensively included in this classification. The regulations on this subject stipulate a health surveillance by specially trained physicians approved by the FANC (Federal Agency for Nuclear Control). For many years now, Belgoprocess has used the services of EMS (External Medical Surveillance) from SCK•CEN (Belgian Nuclear Research Centre) for this health surveillance, a team composed of two registered occupational physicians, three nurses, and one laboratory technician. 'We are responsible for the health surveillance of all employees of SCK•CEN, Belgoprocess and VITO (Flemish Institution for Technological Research)', Dr. Hilde Bertels, EMS department head, explains. 'That's about 2,000 employees, a large number of whom are 'category A employees'. These are employees who are liable to be exposed to radioactive substances or radiation at work. We examine them twice a year. Once on the basis of a blood test and a second time during an extensive medical check-up.'

#### **What can you tell us about the general health of Belgoprocess employees?**

**Dr. Hilde Bertels:** 'The people we examine are generally in better shape than the general population. This is due to the healthy worker effect. The health of the employees is extensively monitored. Each year we make an electrocardiogram to check the heart of employees over 40. All this medical data gives us a good picture of a person's physical aptitude for certain work. Dismantling work in a pressure suit is very taxing on the cardiovascular system. Based on our examinations, we can also reliably estimate a person's risk of dying from cardiovascular disease within the next 10 years. On the basis of this, the occupational physician can give appropriate advice, for example about giving up smoking or referral for further examination. Occupational medicine is preventive medicine. We focus first and foremost on prevention rather than cure.'

#### **What about the radiological risks? Do the radiation doses have a long-term health effect?**

**Dr. Hilde Bertels:** 'In 2020, the average annual individual dose was 0.12 mSv (millisieverts) per employee. 335 of the 346 Belgoprocess employees received an annual dose lower than 1 mSv. The maximum individual dose to which an employee was exposed last year was 2.32 mSv. If you consider that the legal limit is 20 mSv and that Belgoprocess internally applies an even stricter annual dose limit of 10 mSv, these annual doses are low. No serious radioactive contamination has occurred at the sites for years. We have our own decontamination room which we rarely need to use. This testifies to the professionalism of Belgoprocess and shows that the many efforts in the area of safety culture are paying off. Employees have got used to working under strict measures in the interest of their own safety and that of their colleagues. This high level of safety awareness helps explain why the severity and frequency of occupational accidents is also remarkably low at Belgoprocess.'

#### **The strong safety awareness also contributed to the roll-out of the coronavirus measures, as the safety survey revealed (see p. 30, Safety).**

**Dr. Hilde Bertels:** 'True, although people are saying that the coronavirus measures are beginning to weigh heavily. Social constraints in particular are weighing on the atmosphere at work and on individual well-being. Which is very understandable. At the same time, we all realise that we have to hang in there as long as the virus is circulating. Working under coronavirus conditions is difficult, but we will prevail; that is the mindset on the factory floor. I find the resilience of the staff commendable.'

#### **EMS, the medical service, is housed at SCK•CEN, where the decontamination room is also located and all examinations take place. How are the medical examinations organised for Belgoprocess?**

**Dr. Hilde Bertels:** 'Our colleague and nurse Suzanne Kuppens is always on duty at Belgoprocess. She is the first point of contact for first aid and assists with medical check-ups. Suzanne takes the blood samples, schedules the medical examinations, sends out the invitations and helps with the vaccinations. I am talking about the vaccinations against tetanus, hepatitis A, hepatitis B and influenza, not about the coronavirus vaccine. For this vaccine, our employees must wait their turn just like everyone else. Obviously we strongly recommend that everyone gets vaccinated. That's the quickest way out of this health crisis.'

'In any case, the collaboration with Suzanne is excellent. She has been the perfect link between EMS and Belgoprocess for many years now.'

#### **As an occupational physician, you advise the company management on certain decisions. Are you a member of the Belgoprocess Safety working group?**

**Dr. Hilde Bertels:** 'Suzanne is a member of the Well-being working group within the Safety Department, and in that position she actively helps to further develop the safety culture. For instance, I am sometimes asked to exempt operators above a certain age (e.g. 55 or 60) from interventions. Given the physical strain of some activities, this is a legitimate question. I just think that age as the only criterion is too limited to make that decision. Especially as we have been monitoring employees for years. Our collected data give a much more complete picture of someone's suitability. So my advice is to make the decision based on the full health profile rather than just the person's age. A fit 55-year-old operator may still be in perfectly good shape and, moreover, may want to keep doing his job. The successful smoking cessation campaigns were also launched on our recommendation. Thanks to Suzanne who rolled out and followed up the campaign at Belgoprocess.'



Dr. Hilde Bertels, physician; Marc Van Meenen, nurse; Liesbeth Caeyers, laboratory assistant; Roel Naveau, physician; Griet Verherstraeten, nurse. Could not be present: Thomas Mertens, nurse



Tomy Vandevyvere & Tina Caeyers

*'The coronavirus has given an impetus to the collaboration.'*

Tina Caeyers, Purchasing Manager Belgoprocess

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Financial

## Purchasing departments of Belgoprocess and NIRAS work together ever more closely

**T**hanks to this cooperation, NIRAS is now much more in touch with the practical aspects of waste treatment', Tomy Vandevyvere of NIRAS says about the extensive cooperation between the purchasing departments of NIRAS and Belgoprocess. Last year, the two companies decided to act as one in large purchasing projects. 'It is the outcome of an efficiency exercise', says Tina Caeyers of Belgoprocess. 'This cooperation relieves our administration and is financially interesting.'

For the sake of clarity, some background first. In 1980, the federal government set up NIRAS (National Agency for Radioactive Waste and Enriched Fissile Materials) with the task of managing Belgian radioactive waste flows. NIRAS, headquartered in Brussels, was given administrative and financial responsibility. Since waste management also requires an industrial component, Belgoprocess was established as a subsidiary in 1984. In principle, therefore, both companies have a joint responsibility: to protect society against the potential risks of radioactive waste. For the dismantling of decommissioned facilities and the processing of radioactive waste, NIRAS respectively receives funding from the federal government and from radioactive waste producers. Belgoprocess receives most of its operational budget from NIRAS. Several years ago, an in-depth analysis of the processes and operational functioning led Belgoprocess and NIRAS to decide to better align their activities in certain areas. In order to streamline this collaboration, both companies switched to the ERP software package MS Dynamics AX in which all processes and data were integrated. Purchasing, or Purchase to Pay, became an ERP subprogram. 'You may call it a far-reaching collaboration between our two purchasing departments', says Tina Caeyers, Belgoprocess Purchasing Manager. 'A collaboration that creates understanding of each other's situation and specific issues', adds Tomy Vandevyvere, NIRAS Purchasing Coordinator.

#### **What specific projects do you work on together, for example?**

**Tina Caeyers:** 'Mainly larger projects for which we can enter into framework agreements (Ed.: a framework agreement provides a general and flexible framework for concluding individual supply contracts with one or more clients). An example is the preparatory work for Buildings 167 and 151E (see p. 24, Reception & Storage), such as building the access road and moving the perimeter. The use of existing framework agreements made possible the smooth preparation of the sites for these projects.'

**Tomy Vandevyvere:** 'The cooperation is now broader than just technical framework agreements. Purchasing projects such as payroll service bureau, knowledge management and company audits in the area of ISO standards and finance are currently also being handled jointly. Framework agreements for the supply of PPE (Personal Protective Equipment) and work clothing, for example, are also put on the market jointly.'

**Tina Caeyers:** 'The roll-out of ERP has greatly strengthened our cooperation. ERP is a tool in which Belgoprocess and NIRAS centralise part of their company data. In other words, as companies we are becoming more transparent to each other. You get to know each other better, which has led to a growth of trust and a desire to work together more intensively.' In the future, NIRAS and Belgoprocess will therefore always consider concluding new public procurement contracts jointly.'

#### **What are the biggest advantages of this partnership, given that the two companies operate in a different context?**

**Tomy Vandevyvere:** 'NIRAS and Belgoprocess have different responsibilities, but serve the same purpose. To NIRAS it is very important that we can close the gap between the legal-administrative aspect and the practical implementation through the purchasing department. Until two years ago, NIRAS did not have a separate purchasing department. This department was part of the legal department since we simply assess

purchasing projects from the perspective of the legislative framework. Before the coronavirus crisis broke out, I would visit the Belgoprocess site every week. Not to check, but to gain an understanding of the practical aspects of waste processing. Those visits broadened our view of waste treatment and brought about a cultural change at NIRAS. Our approach today is more solution-driven. Naturally, NIRAS monitors the legislative framework, as does Belgoprocess, but we have become more pragmatic.'

**Tina Caeyers:** 'The decision to have the purchasing departments work together was the outcome of a thoroughgoing efficiency exercise. After all, we work with public funds and want to use them carefully and reliably. The cooperation has relieved the administration and created economies of scale. Efficiency gains that also have a positive impact on finances. What I find important is the increased flexibility and the fact that we find a sounding board with each other. We can discuss ideas, brainstorm with each other, but also check each other's work and make adjustments where necessary.'

#### **The law on public procurement has been tightened enormously in recent years. Did that reinforce the need to work together?**

**Tina Caeyers:** 'Since we work with public funds, each purchase is a public contract that must follow the standard procedure. Especially as we work in a safety-sensitive sector, the rules and regulations are very complex. In that respect, NIRAS's legal expertise is a huge bonus. That's what is called working together efficiently. Now, the law on public procurement also allows us to negotiate as a company. Where in the past it was all about buying, today it is also about buying well. With two we are of course in a stronger position to close a beneficial deal.'

#### **Is the ambition to move towards a fully integrated purchasing department in X number of years? A single purchasing department for NIRAS and Belgoprocess together.**

**Tomy Vandevyvere:** 'As was mentioned, NIRAS's purchasing department is still in its infancy. Our view is to first develop our own purchasing department and then gradually integrate it with Belgoprocess's purchasing department. Today that is going well, but there are also challenges and unanswered questions. Also because we come from different corporate cultures. So we don't want to make any mistakes. The final destination is the same, but we are approaching it from a different angle.'

**Tina Caeyers:** 'The coronavirus measures have given an impetus to this process. When the coronavirus struck, we put our heads together to find solutions for our suppliers and contractors. Which deliveries must continue? Which ones can continue? How much delay can we allow? How do we deal with possible compensation? This has resulted in a clear, uniform message to our suppliers. Before the coronavirus crisis, our suppliers would sometimes be confused because Belgoprocess and NIRAS set different priorities.'

'Moreover, teleworking has been the norm for our people for months now. Our fortnightly meeting with NIRAS takes place online and everything is running smoothly. From Dessel, Brussels is now just a mouse click away. That also helps to come out as one team.'

ASSETS (IN 1,000 EUR)	2020	2019	Δ	Δ %
<b>FIXED ASSETS</b>	2,228	1,511	717	47.45
Intangible fixed assets	420	56	363	643.52
Tangible fixed assets	1,808	1,454	354	24.35
Buildings	0	0	0	0.00
Installations	827	816	11	1.35
Office and IT equipment & vehicles	981	638	343	53.78
Assets under construction	0	0	0	0.00
Financial fixed assets	1	1	0	0.00
Participation in enterprises	0	0	0	0.00
Cash deposits	1	1	0	0.00
<b>LIQUID ASSETS</b>	63,522	61,497	2,024	3.29
Accounts receivable after 1 year	0	0	0	0.00
Stocks and orders in progress	5,147	6,656	-1,509	-22.67
Stocks	3,050	3,184	-134	-4.21
Orders in progress	2,097	3,472	-1,375	-39.61
Accounts receivable within 1 year	20,566	18,682	1,884	10.09
Trade receivables	19,959	18,572	1,388	7.47
Other accounts receivable	607	110	497	450.86
Investments	5,285	7,272	-1,987	-27.32
Cash	32,430	28,760	3,670	12.76
Accruals	93	128	-35	-27.13
<b>TOTAL ASSETS</b>	<b>65,750</b>	<b>63,009</b>	<b>2,741</b>	<b>4.35</b>

LIABILITIES (IN 1,000 EUR)	2020	2019	Δ	Δ %
<b>SHAREHOLDERS EQUITY</b>	25,336	24,494	842	3.44
Capital	5,000	5,000	0	0.00
Gains	0	0	0	0.00
Reserves	1,700	1,700	0	0.00
Profit carried over	18,636	17,794	842	4.73
<b>PROVISIONS AND DEFERRED TAXES</b>	2,177	3,581	-1,403	-39.19
Pensions	0	0	0	0.00
Major repairs and contracts	0	0	0	0.00
Other risks and costs	2,177	3,581	-1,403	-39.19
Deferred taxes	0	0	0	0.00
<b>CREDITORS</b>	38,237	34,934	3,302	9.45
Accounts payable after 1 year	2	2	0	0.00
Accounts payable within 1 year	32,625	29,043	3,581	12.33
Trade debts	11,943	7,129	4,814	67.52
Advances received on orders	15,611	17,582	-1,971	-11.21
Debts relating to remuneration and taxes	5,071	4,332	738	17.04
Taxes	22	126	-103	-82.24
Remuneration and social security	5,048	4,207	842	20.01
Other debts	0	0	0	0.00
Accruals	5,610	5,889	-279	-4.74
<b>TOTAL LIABILITIES</b>	<b>65,750</b>	<b>63,009</b>	<b>2,741</b>	<b>4.35</b>

INCOME STATEMENT (IN 1,000 EUR)	2020	2019	Δ	Δ %
<b>OPERATING INCOME</b>	75,306	66,199	9,106	13.76
Turnover	73,575	64,806	8,770	13.53
Changes to order in progress	-1,375	256	-1,631	-637.26
Produced fixed assets	1,105	0	1,105	-
Other operating income	680	1,138	-457	-40.19
Non-recurring operating income	1,320	0	1,320	-
<b>OPERATING CHARGES</b>	74,208	65,121	9,088	13.96
Commodities	7,825	6,109	1,716	28.09
Purchases	7,799	5,659	2,140	37.83
Increase/decrease in stock	26	450	-424	-94.23
Services and other goods	29,591	25,961	3,630	13.98
Remuneration, social security and pensions	31,740	29,880	1,861	6.23
Depreciation and amounts written off	878	533	346	64.88
Depreciation of stock	109	-104	213	-204.46
Appropriation/use provisions	-83	99	-182	-184.12
Other operating costs	2,827	2,643	184	6.95
Non-recurring costs	1,320	0	1,320	-
<b>OPERATING PROFIT (-LOSS)</b>	1,098	1,079	19	1.74
Financial result	45	121	-75	-62.32
Financial costs	303	-57	360	-635.77
<b>PROFIT BEFORE TAXES</b>	840	1,256	-417	-33.16
Withdrawal deferred taxes	0	0	0	0.00
Tax on result	-3	76	-79	-103.29
<b>PROFIT OF THE FINANCIAL YEAR</b>	842	1,180	-337	-28.61
Transfer to tax-free reserves	0	0	0	0.00
Withdrawal to tax-free reserve	0	0	0	0.00
<b>PROFIT APPROPRIATION FOR THE YEAR</b>	<b>842</b>	<b>1,180</b>	<b>-337</b>	<b>-28.61</b>



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