

N.º 10 • Quarterly magazine • March/April/May 2024

FOREST

Hybrid machines in the forest? Yes!

OPINION - NUNO DELGADO PINTO

Biomethane to bring on the decarbonisation of the industry and the circular economy



CAIMA GO GREEN THE FUTURE BEGINS NOW







N.º 10 • Quarterly magazine March/April/May 2024

03 editorial

Altri has a clear policy of making our world more renewable

04

news

08

energy The energy that moves us

12 cover story

Caima Go Green

20 forest

Hybrid machines in the forest? Yes!

25

opinion Biomethane to bring on the decarbonisation of the industry and the circular economy

27

Altri people

Filipe Pimentel, Fábio Mendes e José Oliveira







Prefer to read online or share one of the articles? Find out here





TECHNICAL RECORDS: Property: Grupo Altri – Rua Manuel Pinto de Azevedo, 818 – 4100-320 Porto, Portugal. Coordination: Sustainability, Risk and Communication Department. Director: Sofia Reis Jorge. Edition, editorial coordination and text: C•Studio – Medialivre. Translation: Paula Grilo. Copydesk: Manuela Gonzaga. Design and pagination: Creative Direction - Medialivre Boost Solutions. Print: Norprint. Legal Deposit n.º 430073/17. Frequency: quarterly. Drawing: 3.360



editorial

ALTRI HAS A CLEAR POLICY OF MAKING OUR WORLD MORE RENEWABLE

CARLOS VAN ZELLER E SILVA, Vice-CEO and Executive Director of Altri

The fact that our planet is warming up has forced nations and organisations to take measures to stop this phenomenon from escalating and generating even more extreme weather events, devastating the communities in which they occur.



he main culprits are identified as CO₂ and other gases (methane, Nox -> GHG greenhouse gases), leading to the formation of a global movement dubbed decarbonisation (in reference to the element - carbon - which can be found in CO₂ and hydrocarbons, which are the main constituents of fossil or

non-renewable fuels).

Reducing the impact of these gases has entailed:

• Cutting fuel consumption in absolute terms;

• Substituting fossil fuels with others from renewable sources;

• Capturing CO_2 (and methane) from generation sources. This reality is posing a tremendous challenge to society and particularly to some sectors of the economy whose business activities are more reliant on energy, particularly Europe which relies heavily on third party sources to assure its energy self-sufficiency.

However, this threat should also be considered an opportunity to take the lead in the field of innovative technologies which speed up economic growth and mitigate the risk of external dependence.

With its clear policy of making our world more renewable, and despite only 7% of its primary source of energy (fuels) being fossil-based, Altri's commitments for 2030 include ambitious targets pertaining to the use of fossil fuels and emissions of GHG into the atmosphere:

- 100% of the primary energy used at Altri's industrial units to be from renewable sources;
- 51% reduction of specific scope 1 and 2 GHG (greenhouse gas) emissions and a 25% reduction of scope 3 emissions (kg/adtp) (baseline 2020);
- Reducing specific water use (m³/adtp) at Altri's industrial units by 50%.

Following a period of strong growth over the last few years, and with an ambitious investment plan, now is the time to make operations more efficient and diversify the value creation strategy.

In this edition of Altri News, we will be taking a closer look at some technologies – some more innovative than others which might be up to the challenges imposed by society and by the company itself.

Some articles will address the topic of producing hydrogen and renewable fuels by capturing biogenic CO_2 in our chimneys and how waste from effluent treatment plants and livestock operations may be a significant energy source.

Our group company Caima has recently become the first 3F : Fossil Fuel Free factory in the Iberian Peninsula, and one of the first in Europe in our sector, now that its new biomass boiler is up and running.

news

National Sustainability Award Honorable Mention for Altri

Altri, SGPS, S.A. received an honorable mention in the Circular Economy Large Companies category of the National Sustainability Award for the Celbi project's fine granulometry fibrous material digester. The National Sustainability Award is an initiative by Jornal de Negócios.





Prime Minister visits Caima's new biomass plant

António Costa, the Prime Minister of Portugal, visited the cellulose fiber production unit Caima of the Altri Group. The visit aimed to observe the progress in the construction of the new biomass plant, funded through the Recovery and Resilience Program (PRR), representing an investment of over 40 million euros by Altri. The Prime Minister praised Caima as an example of decarbonization and innovation "within a circular economy" and emphasized that Altri, known for its circular economy approach, "is a group that values the forest and adds value to it.)

Biospot Biotek inaugurated with children from Vila Velha de Ródão

One of Altri's commitments by 2030 is to develop 13 Biodiversity Stations (EBIO) and biospots. In June, Altri celebrated the new Biotek biospot with 55 children from schools in Vila Velha de Ródão. Currently, the Group has seven EBIO and biospots.

An EBIO is a circular path that passes through an area with high conservation values, using interpretative panels along the way to showcase the main habitats and species of various ecosystems, such as riparian forests. A biospot aims to highlight more isolated or small-sized locations that are the micro-habitat of unique flora and fauna species.



50 million in green bonds for the "Caima Go Green" project

The Altri Group has secured financing of 50 million euros through the issuance of green bonds, with a maturity of up to five years, for the "Caima Go Green" project. With this operation, organized, assembled, and fully subscribed by Banco BPI, it will be possible to fund the installation of a new biomass boiler and a new 5 MW turbo generator at Caima, in Constância, which will operate using residual forest biomass.

The new boiler will enable Caima to abandon fossil fuels throughout its production process, ensuring complete energy autonomy from exclusively renewable sources. It will be the first Iberian company in its sector to achieve this historic milestone.

601 million euros in revenue in the first nine months of 2023

Altri achieved a net profit of 28.2 million euros in the first nine months of the year. EBITDA reached 97.5 million euros, in a period where revenues amounted to 601 million euros, representing a year-onyear decrease of 25%. The more positive outlook for the evolution of cellulose fiber prices does not preclude the ongoing



cost optimization efforts, simultaneously reinforcing the goals of sustainable growth.



KAIZEN awards Altri's "2030 Commitment"

The Altri Group won the 12th edition of the KAIZEN Awards Portugal in the Sustainability category, for the work carried out under its "Commitment 2030," focusing on the promotion and conservation of forests while implementing projects to reduce emissions of polluting gases into the atmosphere. This initiative improves production efficiency and generates estimated savings of 6 million euros.

Altri joins the Portuguese Integrity Platform

Altri joined the PPI at the membership ceremony held during the "Integrity Forum," part of the ESGWEEK, representing the Group's commitment to integrity and SDG 16 - Peace, Justice, and Effective Institutions. The PPI was created in 2019 by the United Nations Global Compact and the Portuguese Association of Business Ethics as a result of the Anti-Corruption Campaign, serving as a private sector call for governments to promote anti-corruption measures and implement policies establishing good governance systems.



news

Biotek, Caima, and Celbi renew the Innovator Status granted by COTEC

Biotek, Caima, and Celbi were distinguished with the INNOVATOR COTEC Portugal Status for 2023. This status is awarded annually in recognition of companies that combine high standards of financial stability, operational efficiency, and technological innovation potential to generate robust, profitable, and recurring growth.

inovadora'23





RFM SOMNII and BR FEST's 2023 Official Sustainability Partner

The Altri Group was the Official Sustainability Partner of the RFM SOMNII and BR Fest 2023 festivals, opening a "door to the future" where best environmental practices ensure planet care, and where new talents can be part of a cutting-edge industry. Throughout the two festivals, there were several surprises for festival-goers, who learned about the work being done in support of nature conservation values.



Altri ranks in the global top 5 in sustainable companies in the Paper and Forest cluster

With an overall score of 14.7 points in Sustainalytics' ESG Risk Ratings, the Altri Group climbed to the fourth position in the Paper and Pulp sector, among 59 companies worldwide, being one of the best-performing companies globally in sustainability. This score and strong performance strengthen the status of "Low ESG Risk Company," presenting Altri as a secure investment for investors. This is the highest rating ever in the assessment conducted by Sustainalytics, reflecting Altri's commitment to ESG challenges and in line with the company's "Commitment 2030."



PROUD TO HAVE COMPLETED THE BUSINESS & HUMAN RIGHTS ACCELERATOR TO MOVE FROM COMMITMENT TO ACTION ON HUMAN RIGHTS IN MY COMPANY



Altri welcomes 54 young people to the Summer Academy

This summer, Altri welcomed 54 young people, aged between 17 and 23, as part of the '23 Summer Academy. This initiative aims to provide a first contact with the real world of work, giving them the opportunity to deepen their knowledge in their study areas and improve their understanding of the pulp and cellulose fiber production industry.





By participating in the United Nations Global Compact's Business & Human Rights Accelerator, Altri took a step forward in advocating for human rights.

Integration into this program helped identify and find ways to diagnose, prevent, and mitigate potential impacts on human rights from Altri's operations and throughout the value chain, applying new tools and skills acquired to take action on human rights matters.



National Sustainability Day

Altri celebrated National Sustainability Day with the children of its employees, making them Junior Ambassadors of Altri Sustainability. About 30 children and young people participated in a set of activities designed to introduce them to the biodiversity of our forests, the importance of their preservation, raising awareness of the climate emergency we are experiencing.



Altri in the top 1% of companies rated by EcoVadis

The Altri Group was awarded the Platinum Medal in the assessment conducted by EcoVadis, an entity that analyzes companies in the areas of Environment, Labor and Human Rights, Ethics, and Sustainable Procurement. Altri scored above average in all areas. In the Environment category, it achieved a score of 90 out of 100. In the Pulp, Paper, and Board Production sector, the Group ranked in the Top 1% of companies rated by EcoVadis, achieving 78 points out of a maximum of 100. energy

GUALTER VASCO, Director of Digital Transformation and Asset Management at Altri

THAT MOYESUS

Our industry has, throughout the decades, been faced with challenges which force companies to reinvent themselves. The evolution of the sector and its ability to remain profitable have been determined by how we use energy. This has been the key to its success. Now we are being called upon to deal with global challenges whose impacts reach beyond our sector. What role might we play? And how does this relate to the energy that moves us?

11111A

he first cellulose fibre factories were mostly dependent upon steam, both as a thermal energy source and to provide energy to drive machinery; wood and coal were the main sources of primary energy.

The gradual electrification of industry from the end of the 19th Century brought with it huge efficiency gains: the development of the electric motor allowed steam engines to be replaced and the use of fuels to therefore be reduced, and innovations to the electric generator enabled factories to generate their own electricity. Thanks to the *War of the Currents* between Westinghouse and Edison, industry as a whole took a few steps forwards and the cellulose fibre industry was no exception. Generators had mostly been water-powered, but steam turbines quickly took on an increasingly important role. It was around this time that petroleum was discovered, and the first commercial oil wells began operation in the USA, ushering in a new era.

Petroleum revolutionised industry, not only as an energy source but it also led, for example, to the development of lubricants needed for the increasingly large and more complex machinery. Another factor was the new industries which sprang up from products manufactured from oil. From an energy standpoint, industry started switching from the energy sources then in use – which were almost exclusively renewable – to oil-derived fuels.

The industrial growth and economic expansion which followed has created new challenges. Competition between peers forces companies to focus more attention on how they use resources, including energy. Industrial processes are adapted to make better use of heat and the combined production of heat and electricity – cogeneration now tends to be the rule.

The next major leap forward occurred during the 1930s with the invention of the recovery boiler for the kraft process; this milestone - arguably the most important in the history of cellulose production - virtually closed the cooking cycle, and in addition to enabling inorganic materials to be recovered and thermal energy to be generated to fuel a major portion of the factories' needs, it also meant a very significant reduction in the environmental impact caused by the factories. G. H. Tomlinson's invention was motivated by desire to recover chemicals, but his work actually had a disruptive impact on the energy profile of pulp mills by directly improving companies' profitability and thereby encouraging the growth of the sector, leading to the widespread use of the kraft process and consigning other chemical pastes to niche markets.

The cellulose industry's expansion following the Second World War, very much driven by demand from and economic growth of the west, did not pay heed to what are now considered indisputable values. Efficient use of resources, sustainability and circularity were way down the list of priorities and were only very occasionally taken into consideration. Up until the first oil shock in 1973.

Exactly 50 years ago, as a result of the Yom Kippur War, a coalition of Arabic countries proclaimed an embargo on oil exports to the west, leading to prices rocketing which reverberated throughout the global economy. Rising production costs – caused directly by energy costs and indirectly by higher chemical prices – forced the cellulose industry to re-think its processes.

ALTERNATIVES TO PETROLEUM-DERIVED CHEMICALS

The search was on for alternatives to petroleum-derived chemicals and those whose production is oil-dependent, and also for alternatives to fossil fuels.

With regard to chemicals, there was not much to be done other than optimising their use by reducing consumption and recovering as much as possible. The search for fossil fuel alternatives, however, saw the emergence and gradual spread of renewable fuels, particularly biomass, wood waste and other forest residues. Many factories brought their coal-powered boilers back into service or adapted fuel-oil boilers to burn these "new" fuels, although mostly in ways which were far from being the most efficient. But in times of war, they had to make do.

In the final decades of the 20th century, more effort went into developing technological solutions to ensure efficient energy production from biomass. It should be pointed out that for most of the industry, the term "biomass" encompasses waste wood, sawdust and bark, as well as forest residues. This period saw great improvements in boiler performance; it became possible to burn more challenging biomass more efficiently, and there was an expansion of the range of waste products which could be used. Parallel development paths opened up and solutions emerged for the gasification of such fuels, to offer solutions to clients unable or unwilling to invest in new boilers, so that they too could have an alternative to fossil fuels. Nevertheless, these options were not broadly taken up and even

> Altri is committed to decarbonizing industrial operations, by eliminating fossil fuels as a primary energy source by 2030

energy

today most pulp manufacturers choose to use biomass boilers. This is a brief summary of the path that has brought us where we are today. Throughout our industry's 150-year history we have seen that energy matters can be addressed by solutions, techniques or simple business restructuring to respond to issues relating to our environmental or social impact or just to keep production costs under control to guarantee the profitability required to keep mills in operation.

Business profitability is an ever-present concern. Unprofitable companies wither and die. But beyond this obvious problem, today we have to deal with strict environmental and sustainability demands. We are required to put together fossil fuel replacement plans and improve our sustainability performance. The global targets are tough. All of us – citizens and companies alike – have to combat climate change. How can we contribute towards this global cause?



1922 - Electric generator driven by diesel engine. The Caima Estate and Wood Pulp Company Lda. Source: Caima S.A. document collection

CAN WHAT BROUGHT US HERE; TAKE US FURTHER?

These goals are certainly ambitious and will force us, in some cases, to implement solutions which aren't yet commercially available or for which there are few examples to study.

The primary goal seems easy: we just have to cut consumption and increase production. We should continue to optimise operations to reduce consumption and seek out ways to increase generation. To achieve the increments as per our commitment, we are going to have to keep investing in generation for selfconsumption. We have almost finished installing production units equipped with PV panels at all our factories and in the Viveiros do Furadouro tree nurseries. In total, these UPACs will account for over 15MW of the installed power and will contribute decisively towards reaching our goal, insofar as the increased amount injected into the grid will equate to the UPAC energy produced. This solution will probably be expanded, with more panels installed at our factories and elsewhere.

In terms of decarbonisation, however, the solutions are less obvious. At least for Biotek and Celbi. In order to decarbonise these two factories, we need to find renewable fuels to power the lime kilns, which represent just over 90% of the total fossil fuel consumption each. Caima does not have a lime kiln and with the new biomass plant coming on line it will no longer require natural gas. By the end of 2023 it will be the first Portuguese (and probably European) factory to be fossil fuel free.

SEVERAL OPTIONS ARE AVAILABLE TO REPLACE THE FOSSIL FUELS WE CURRENTLY USE IN OUR MILLS / FACTORIES

There are several examples which use timber as fuel, either where the timber is gasified and then the synthesis gas burnt, or where it is directly burnt after being chipped and pulverised. These solutions are fairly commonplace in regions where wood or wood waste is abundant, such as in South America and Scandinavia. It is common knowledge that there is a lack of wood for paste in Portugal, so what wood there is has to be used for this purpose. Furthermore, these solutions require heavy investment in machinery.

Another solution which is somewhat common and easily applied, is to burn factory-produced methanol. This method doesn't usually raise any major difficulties and may contribute greatly towards decarbonisation. Methanol already represents around 15% of the primary energy used to fuel the kiln at Celbi, and this solution is being studied at Biotek, where methanol is not extracted. These solutions that are based on using existing local resources appear to be the easiest to implement.

A different approach is to use lignin as fuel. The most well-known method is commercially known as Lignoboost and allows the lignin to be extracted in solid form, thereby enabling it to be sold on the chemical industry market or used as fuel. There are some known examples, but the high costs of investing in both the lignin production facility and in adapting the kiln firing systems render this solution unappealing.

Another alternative that is increasingly being talked about is hydrogen burning. Hydrogen is clearly going to play a key role in decarbonising the economy. In our specific case, it can be used as furnace fuel, but with some limitations. Its flame temperature is substantially higher than that of natural gas, which means additional precautions need to be taken, both in terms of controlling the process and monitoring the effects on the kiln materials; special refractories are needed and the me-



Photovoltaic panels, aerial photography of Celbi's UPAC - September 2023 Source: Celbi's collection

tallurgical properties of the metals involved have to be taken into consideration. The examples known are mainly facilities where hydrogen is available as a by-product, resulting from the on-site production of other chemicals, and these examples show that up to 30% of the kiln's needs can be met by burning hydrogen.

Green hydrogen is produced by water electrolysis using renewable electricity and can be used as a fuel, as a method of storing energy or to be injected into the natural gas network, or even to produce other renewable fuels.

European policies in matters of decarbonisation foster projects to produce hydrogen and inject it into the national natural gas network in quantities which will enable widespread use, meaning that all consumers of natural gas will also be consumers of green hydrogen.

Another green fuel which can be a substitute for natural gas is biomethane. Biomethane is simply methane gas produced from renewable sources, usually via the anaerobic digestion of agricultural (crops and livestock) waste, leftover foods or organic WWTP sludge. Waste resulting from such digestion can be used directly as an agricultural fertiliser. Caima has been using this technology since 1991 to treat part of its effluent. producing biogas which fires its boilers. Biomethane is a direct replacement for natural gas and its use does not require any alterations to the existing facilities, hence one possible means of decarbonising our operations may be to develop biomethane production projects; implementing such projects close to the factories may create synergies where, for example, factory sludge is used as a raw material. This technology is already in place and there are thousands of facilities of this kind in Europe. Most European states currently have ambitious plans to expand biomethane production. In some countries, it accounts for a very significant percentage of the gas consumed.

The solutions set out above could be part of the roadmap for the decarbonisation of our industrial operations, thereby allowing us to achieve our targets. It involves projects of varying degrees of complexity, encompassing technologies at different levels of maturity and requiring significant amounts of investment.

Altri's role in decarbonisation issues does not end with replacing the fossil fuels used in our factories with green fuels. We can participate more globally and contribute towards other sectors of the economy finding alternatives leading to their decarbonisation. A particularly difficult sector is transport; despite the increased percentage of electric light passenger vehicles, the electrification of aviation or large container ships is nowhere on the horizon. Renewable replacement fuels need to be found for these sectors, which can be used for fleets already in operation. The solution entails producing synthetic fuels, or e-fuels. These fuels are produced using green hydrogen and green CO₂, captured, for example, from smoke and fumes from a recovery boiler or biomass boiler; different chemical reactions can be used to create fuels which can be a direct replacement for jet-fuel, petrol or diesel. Projects of this kind have been announced throughout Europe, chiefly for the production of SAF - Sustainable Aviation Fuel or e-Methanol geared towards the shipping sector. Our factories are sources of green CO2 and could be anchors for projects of this nature, which are extremely complex and entail investments of hundreds of thousands of euros.

An e-methanol production facility, for example, installed next to one of our factories could generate beneficial synergies for both. As well as providing CO_2 , we could use the final effluent to produce hydrogen or BP steam or hot or cold water; hydrogen production generates surplus oxygen, much more than normal factory consumption, which as well as its usual applications can, for example, be used in aeration at the WWTP thereby allowing the number of used compressors to be reduced, or mixed into the boiler or kiln combustion air, leading to lower ventilator consumption. Finally, we could use part of the hydrogen or e-methane produced to supply the kiln, instead of natural gas.

My aim here has been to provide a brief outline of the options available to help us in this marathon. At Altri we are committed to achieving the goals we have set, and we are aware of our role within the community. We feel it is our obligation to be part of the solution to rise to the challenges facing society. And once again we are having to reinvent ourselves. And once again the solution could be based on the energy that moves us.





cover story



RAQUEL ALMEIDA, Industrial Director of Caima

CAIMA GO GREEN: THE FUTURE BEGINS NOW

Welcome to the first Iberian factory producing cellulose fibers free from fossil fuels.

critical aspect of the energy transition is decarbonization, involving the gradual reduction or elimination of the use of fossil fuels, a significant source of carbon emissions, and adopting low or zero-carbon energy sources. In 2024, a new future awaits Caima. With the new biomass boiler – Caima Go Green – Caima discontinues the use of fossil fuels in its production process, becoming one of the first in the industry to achieve this historic milestone.

This project will maximize the generation/sale of electrical

energy to the grid, eliminating the use of natural gas. By using biomass, we will ensure the factory's steam needs, allowing for increased production levels. This investment will also enable the implementation of innovative specialty projects, such as the production of acetic acid and furfural, recovering these green compounds from process streams that can be marketed with high added value. A forward-looking project considering the future, based on the pillars of innovation, sustainability, and continuous improvement associated with the circular economy.

CAIMA GO GREEN: A FUTURE BEYOND FOSSIL FUEL

Altri has a new biomass plant at Caima's facilities, to produce steam and electricity through a cogeneration system.



PAULO CARDOSO, Engineering Director at Altri

sing biomass to ensure the factory's steam needs are met; ending the consumption of natural gas (carbon neutrality); maximising the generation/ sale of electricity, by exhausting the condensing turbine's installed capacity; substituting the exis-

ting biomass boiler, which is in poor condition, with a new unit that has a better environmental performance; creating reserves for future steam needs and putting conditions in place to exhaust the installed capacity at the GreenVolt plant. These are the main goals which led to the decision to roll out the Caima Go Green project.

The investment decision and the plant's engineering and construction phase took place during a period of great socioeconomic instability, namely the Covid-19 pandemic, with significant and at times inexplicable increases in raw materials prices, the war in Ukraine, and more recently, high inflation. All of this instability has been challenging progress, chiefly in terms of planning and meeting the initial budget. It should be pointed out that delivery times and costs of material are not what they were three years ago.

The biomass plant was designed, planned and built based on the latest concepts and technologies, in order to guarantee the greatest reliability and economy; maximum availability; a high degree of automation; minimised environmental impact; fulfilment of the most rigorous safety requirements for people and facilities and strict compliance with hygiene standards and best practices.

The team assembled to implement this project comprises employees from the group's three industrial units, to encompass all the specialities and functional areas. The experience and knowledge brought to the project by each member of the team were decisive in progressing the work under what have, at times, been adverse circumstances.

cover story



Summary of the plant's main features:

Deployment area: 2600 m²; Chimney height: 50 m Max. height of boiler building: 40 m Thermal power: 76 MWt; Steam production: 90 t/h (25 kg/s, 90 bar(a), 480 °C) Boiler's thermal efficiency: 88.5 % Steam flow at turbine inlet: 48 t/h Generator output: 4.95 MWe Generator voltage: 3,3 kV From an environmental standpoint, the project will enable full compliance with the Best Available Techniques (BAT) and Associated Emission Values (AEV-BAT), as considered in the BREF BAT conclusions, applicable to boilers that use biomass as fuel, namely new facilities with a thermal power lower than 100 MW. This new biomass plant will have a 76 MWt thermal power, and will operate producing high-pressure steam in a fluidised bed boiler, which will then be fed to an extraction condensing turbine to produce electricity in the corresponding generator. The remaining steam will be sent to Caima's high-pressure collector, to exhaust the capacity of the TG5 condensing turbine.

In short, the boiler is based on fluidised bed technology, in other words, on creating a suspended mixture of solid particles and gas, obtained by blowing primary air through the bed material – in this case a layer of sand – which lies on the bottom of the furnace, made up of a horizontal pressure tube grate, equipped with an appropriate air injection system. When in operation, the grate tubes are filled with water (hydro beam grate), thus the bed reaches more moderate temperatures than with other technologies.

The steam generated in the boiler will be expanded in a turbine with extractions and condensation. The turbine is coupled with a 4.95 MWe electric generator. In addition to the final



The GoGreen project is a new phase in Caima's 130-year history



It should be noted that special attention was given to the buildings' architectural features and the visual aspect of the construction reflects a vision where form follows function, with care taken to ensure that the proportion, colour and texture relate to the surroundings exhaust for condensation, the turbine has two intermediate steam extractions to be used as feed steam for the existing TG5 turbine.

It should be noted that special attention was given to the buildings' architectural features and the visual aspect of the construction reflects a vision where form follows function, with care taken to ensure that the proportion, colour and texture relate to the surroundings.

The project does not significantly alter noise levels, but air quality will improve when the current boiler is withdrawn from service.

The electricity licensing process is currently underway for the new plant switch-on, and in tandem with this, to increase the connected load to the public grid {Rede Elétrica de Serviço Público (RESP)} from 9,200 kVA to 11,040 kVA.

The project implementation time was around 22 months, from when the decision was made with the purchase of the boiler in December 2021, through the purchase of the turbine in May 2022 and following the DGEG's awarding of the production licence (also in May 2022), all the way to the facility being brought on line. The continuous steam production started in November 2023, and the electricity generation in the new turbogenerator began in January 2024.

cover story

A NEW LIFE FOR CAIMA

The Caima Go Green project was well accepted by everyone. The investments made have brought a new forward-thinking energy / mindset. A better future for the company and for the region.

he boiler's new operators cite many reasons why this feels like a new page is being turned in the company's 130-year history. A brighter and more prosperous new future for all. According to the workers we spoke with, the main reason is "the chance to more efficiently increase the factory's production." Caima's transformation into a biorefinery which employs the latest technology is what makes it a pioneer which will derive maximum benefit from the raw materials it uses.

Guilherme Ferreira, the energy process assistant technician, says they are "broadening the range of value-added products the factory produces, by minimising the waste created and decreasing Caima's exposure to market fluctuations."

He was able to monitor some of the operations involved. He didn't oversee them from start to finish, but was involved in the chemical cleaning of the boiler, which allowed him to "begin to grasp the dimension of the project and better understand the facility." Guilherme Ferreira's involvement was truly begin during the start-up phase. He is one of the employees responsible for monitoring the operation of the boiler. Now is the time to get it up and running.

André Costa is in training to be the factory coordinator. The Caima Go Green project represents an opportunity, a step upwards. Furthermore, production will become more sustainable, it will become self-sufficient in terms of energy, and more competitive which, André Costa believes, "opens the door to new projects". For all these reasons, the kick-off of the Caima Go Green project is "an historic milestone and a strategic vision for the future."

The company's plant operator, Pedro Grave, says he "had no idea of the magnitude, because it's one thing to see the blueprint but quite another to see the project at full scale." Pedro acknowledges that this is the third boiler installation he has witnessed, but the dimension and technological evolution "have taken a great leap, which can be seen in all the machinery which feeds the biomass." It should be noted that it is "a boiler with a different goal and a clear potential."

According to the plant operator, the technological leap taken by Caima Go Green project enables an increase in production, lower energy consumption, reduced gas emissions and improved safety.



The dimension and technological evolution have taken a great leap, which can be seen in all the machinery which feeds the biomass



André Costa, Trainee Factory Coordinator Guilherme Ferreira, Energy Process Assistant Technician Pedro Grave, Plant Operator







PEDRO SILVA, Procurement and Forest Development Manager at Altri Florestal

HYBRID MACHINES IN THE FOREST? YES!

This machinery is the start of reducing our environmental footprint in forestry.

LOGSET



forest



Hybrid machines

n response to the growing environmental pressures of the global market, as well as from many of the world's governments and organisations, industrial machinery manufacturers have this century and particularly in the last decade begun to move towards building and selling machines that emit significantly fewer harmful gases (carbon monoxide, hydrocarbons, nitrogen oxides and fine particles). This goal has already been met by building more highly developed and efficient (stage IV final and V) diesel engines, equipped with particulate filters and catalytic converters (AdBlue). Nevertheless, we had (and will have) to "go beyond", and this is why we are now seeing more and more zero-emission electricity-powered industrial machinery operating at factories and logistics and warehousing facilities. This includes handling machinery (cranes, fork-lift trucks) and also excavators, usually called rotary diggers. Many of these machines are, however, permanently connected by cable to the energy source. Altri's manufacturing facilities and warehouses also has electrical equipment working around the clock.

However, forest sites have more restrictions, of which the most easily identified is the lack of access to a power (electricity) source. This renders it unfeasible to use electrical machinery with low autonomy or which needs to be permanently connected, such as those currently available on the market. This led to our decision, in 2022, to scour the market for equipment which would best meet the goals Altri had stipulated 69

The first pieces of machinery started working for us in 2022, but the majority were only available in 2023 given the difficulties and long waiting times for the delivery of the machines and the assembly of their safety packs which are a compulsory requirement in forestry operations.



The Volvo EC250E reduces CO2 emissions by 15%

Pedro Silva, Procurement and Forest Development Manager at Altri Florestal

for its forests – lower harmful gas emissions resulting from our operations.

Of course, the equipment to be considered could not be overor under-sized, less productive or less resistant than the corresponding alternatives with combustion engines. Compliance with these requirements led to Altri opting for hybrids with coupled hydraulic technology to complement the diesel engine. The underlying idea which supports the majority of this kind of machinery is that the hydraulic system provides the boost necessary to complete a certain task, thus maintaining the diesel engine in steady state. As a result, smaller engines can be used, and the power and torque are optimised and improved, while their operation and rotations remain unaltered. All of these features combine to reduce consumption and thus emissions.

Having analysed the available selection of this kind of machinery, with a view to making a purchase, it was decided to establish partnerships with service providers who would be prepared to make this kind of investment, in return for a guaranteed amount of work per year, to offset their expenditure. The first pieces of machinery started working for us in 2022, but the majority were only available in 2023 given the difficulties and long waiting times for the delivery of the machines and the assembly of their safety packs which are a compulsory requirement in forestry operations.

During this initial stage, Altri managed to establish partnerships with seven service providers, making a total of nine machines: five for logging and four for land preparation.

One fundamental aspect of introducing this machinery is being able to obtain data pertaining to production, productivity, consumption and emissions.

Since only from the middle of this year will we be able to have a statistically relevant umber of machines operating on Altri properties, this task is currently still at the beginning but it is underway. Nevertheless, the case-by-case data obtained from the machine computers shows a decrease in consumption (more important in land preparation work). This data will of course have to be made with machines that have similar characteristics, but which are powered by conventional combustion engines. Our goal for 2024 is to implement an automatic system that sends and receives all the above data by telemetry.

Finally, I would like to say that Altri Florestal is keeping abreast of all the developments of a market which is going through great change, and we have therefore cultivated direct contacts with the main machinery manufacturers represented in Portugal (Volvo, Ponsse, John Deere, Caterpillar, Komatsu, Hitachi), in order to gather the most up-to-date and accurate information available to the consumer market.

From these contacts we have gleaned that the first forestry machines will be for sale by the end of 2024 that will be fully electric without needing to be permanently connected to a power source and with increased autonomy. 2026 will see the first forest machines that are hydrogen-powered.



THE FIRST HYBRID HARVESTER IN PORTUGAL IS WORKING FOR ALTRI

ortugal's first hybrid harvester - the Logset from Finland – set to work in the area of Abrigada, in Alenquer, operating for Altri Florestal, via service provider Manuel Moreira da Rocha & Irmão. The machine, costing around 500 thousand euros, was operating at an Altri Florestal site of approximately 100 hectares. Being the first one in Portugal, "the Finnish manufacturer had to reset some of the parameters on the sensors so that it would better handle the characteristics of the terrain in Portugal", explains José Rocha, the manager of Manuel Moreira da Rocha & Irmão, adding that the reason for using this hybrid harvester is "to reduce CO₂ emissions", a requirement which Altri Florestal is imposing on its partners and suppliers.

Ten kilometres away, another forest operator, +VLO – Lavouras do Oeste, was working with a Volvo EC250E hybrid, a 26-tonne crawler excavator which cuts CO2 emissions by 15%. This machine goes for around 175 thousand euros, but according to +VLO's manager Nuno Almeida, "it's very comfortable and ergonomic to operate, and uses an average of 3 litres less fuel per hour, in comparison to other machines of an equivalent size."



José Rocha, manager of the company Manuel Moreira da Rocha & Irmão and Nuno Almeida, manager of +VLO – Lavouras do Oeste



Will the forestry trucks of the future be powered by hydrogen or electricity?

Pedro Silva, the Procurement and Forest Development Manager at Altri Florestal, explains that transporting all the wood materials (wood, chips, biomass) for consumption across the entire Altri Group is an operation that involves hundreds of freight trips every day, to and from Altri's factories. While it's true that the makers of these vehicles have already come up with models that are in testing and in production (particularly electric vehicles), vehicles of the type that are more suited to our transport needs - with five or more axles - are still at a very early stage of development and marketability. This is especially true when it comes to transporting heavy loads, as is the case with wood materials in Portugal (up to 60 tonnes). Weight greatly affects transport autonomy in today's electric vehicles (much less distance covered).

Hydrogen-powered vehicles could be more suited to transporting heavier loads over longer distances, but development of this kind of vehicle has been slowed down by the fact that there is practically no hydrogen supply network in Europe (nor worldwide). In addition to the work being done on developing forest machinery, Altri's vehicle fleet has also been earmarked for an overhaul in an effort to cut emissions. Altri's medium-term aim is to introduce some vehicles that use alternative less polluting energy sources.





BIOMETHANE TO BRING ON THE DECARBONISATION OF THE INDUSTRY AND THE CIRCULAR ECONOMY



NUNO DELGADO PINTO, Member of the Executive Committee and Head of Biomethane, REGA Energy

ustainability is already one of the most significant factors of competitiveness in the majority of markets.

The pressing urgency to enact energy transition, driven by the climate emergency together with Russia's invasion of Ukraine having a dramatic impact on the energy sector, has catapulted the decarbonisation of the economy to the top of the European and US public policy agenda, supported and encouraged by growing public opinion, particularly among the younger population.

The three pillars of sustainability — environmental, economic and social — are also essential to any corporate strategy, since sustainability is demanded by all parties involved along the value chains, and especially by the end customers, and increasingly by financiers.

Industrial sectors, and in particular those with greater energy needs owing to the high temperatures required by their processes (and which are therefore major consumers of fossil natural gas), are now having to urgently implement an effective decarbonisation policy to substitute natural gas with alternative solutions that foster an effective reduction in their CO_2 emissions.

As is already the case in many European countries, biomethane will in Portugal be one of the key players in the process of decarbonising "hard-to-abate" industries. This important role arises from the fact that biomethane is 100% renewable, is a perfect substitute for natural gas, with an equivalent CH_4 percentage, and can therefore be carried and distributed without limitation by the gas network, and hence can be used by industry with no need to make any process adaptations, in other words, without requiring additional investments.

DENMARK'S EXAMPLE

Denmark is a prime example. In 2022 biomethane represented around 30% of the gas in circulation in the Danish gas network, and this figure will rise to 40% in 2023, on the path towards total decarbonisation of its network by 2030.



Biomethane is the quickest and most effective way to meet the industry's decarbonisation goals.

opinion

The foreseeable shortage over time (owing to the limitations of the raw material), compared with the potential demand, is perhaps the only reason why biomethane cannot be named as the solution for the total decarbonisation of industry and the remaining natural gas consuming sectors. Nevertheless, biomethane is right now clearly the quickest and least expensive solution to replacing natural gas, after all process electrification capacity has been exhausted.

Both the anaerobic digestion of organic matter and the purification into biomethane of the biogas generated during digestion, are definitely mature technologies, implemented at an industrial scale throughout Europe, with over 1500 units in operation and an annual growth of around 20%. It is, therefore, a "ready-to-go" solution.

The primary energy source of biomethane is biowaste, which, in tandem with the sun and wind, forms the trifecta of renewable sources capable of decarbonising the planet, although it is the only one of these which is not intermittent.

This makes it a renewable gas with a guarantee of origin and proof of sustainability, and depending on the origin of the organic matter, it could be carbon neutral or even carbon negative.

All of the above shows that biomethane is the quickest and most effective way of meeting the industry's decarbonisation goals, by mitigating or even cancelling out (in cases of total replacement) the risks associated with the expected rising costs of carbon permits.

The raw material used for biomethane is animal and vegetal biomass (food leftovers, agricultural waste and livestock effluent). This prevents methane (which, as a greenhouse gas, is 21 times more powerful than carbon dioxide) from being released into the atmosphere and produces a renewable gas and fertilizer/biostimulant for agricultural use.

RECYCLING ORGANIC WASTE

In practice, producing biomethane promotes a suitable channelling and recycling of organic waste, thereby minimising its impact on the air, soil and water, and releasing its energy potential and creating a clean digestate that is rich in nutrients and organic matter, to be returned to the soil as agricultural fertiliser.

Producing this renewable gas also brings irrefutable environmental gains: at agricultural, livestock and agro-industrial holdings, as a result of appropriate treatment of the waste and effluent generated, and of cutting the use of chemical fertilisers. Biomethane production units thus take care of two cycles: the gas cycle, both by effectively cutting greenhouse gas emissions and producing a renewable gas; and the nutrient cycle, by recovering them and returning them to the soil. The social gains are also hugely important, and simultaneously enhance rural areas where most of this waste is produced (and so often mishandled), and generate employment and strengthen populations in some of the most demographically disadvantaged areas, thereby contributing towards better territorial and social cohesion in Portugal.

Within the framework of European Union policies, biomethane is currently regarded as a fast way of decarbonising industry and even as a means of encouraging the reindustrialisation of Europe (since it is an endogenous resource) which will reinforce the continent's energy security, by reducing imports and reliance on Russia and other potentially unstable regions. This is an excellent example of the circular economy promoting sustainability in the region in which each project operates, and across the entire planet, by cutting global emissions. Focusing on biomethane is an embodiment of the principle Think Globally, Act Locally.



This is an excellent example of the circular economy promoting sustainability in the region in which each project operates, and across the entire planet, by cutting global emissions.



FILIPE PIMENTEL

Recovery and Energy Sector Manager at Biotek

How long have you been with Altri?

I have been working at Altri for 9 years, since 2014.

What does your day-to-day involve at the company?

My daily routine involves monitoring and analyzing the most important procedural variables for the process, taking corrective action in case of any deviations, along with my team. Every day, a kaizen meeting is held in the control room, where the main indicators are discussed and analyzed. We work every day with the goal of improving and optimizing the process

What motivates you in your role?

The constant daily challenge is what motivates me the most in my role. Keeping the process as stable as possible and overcoming the most demanding situations that may arise daily, with the help of my team. It's the daily communication with various team members and, most importantly, the challenge of keeping the team motivated.

Is there a moment at Altri that has stood out for you? Can you explain?

The most memorable moment at Altri was the first black liquor burning in the new recovery boiler. It was the culmination of a challenging and demanding year in the Tejo Project 2018.

How do you see the future of the company?

I envision a company that is increasingly sustainable and competitive, concerned with the development of its people and aligned with the highest quality standards.



Recovery and Energy Sector Manager at Caima

How long have you been with Altri?

I've been with Altri for 7 years, since September 2016.

What does your day-to-day involve at the company?

The days start with the daily kaizen meeting with the teams, where the plan for the main tasks of the day is outlined. Each day then evolves based on respective priorities. We have multiple ongoing improvement programs that require planning and task execution.

What motivates you in your role?

It's a role with many challenges where no two days are the same. The opportunity to contribute improvements to the process is a constant motivation.

Is there a moment at Altri that has stood out for you? Can you explain?

The recent replacement of one of the evaporator heat exchangers stands out. This moment allowed us to restore the evaporator's capacity and consequently increase the factory's production.

How do you see the future of the company?

I believe it will continue its path as a reference in sustainability and operational efficiency. Additionally, I think the future will increasingly involve product diversification, but always starting from a forest-based foundation.



JOSÉ OLIVEIRA

Recovery and Energy Sector Manager at Celbi

How long have you been with Altri?

I've been with Altri for 8 years, joining the company in June 2015.

What does your day-to-day involve at the company?

My daily routine involves overseeing the assignment of tasks to maintenance teams and assisting in defining priorities for the day's work if needed. Afterward, we discuss the most relevant procedural indicators for the process and any necessary adjustments.

What motivates you in your role?

I am motivated by the opportunity to apply the knowledge I have gained over the years, constantly learning new things as almost every day presents different challenges. Working with teams to solve problems and achieve better results tomorrow than today is what drives me.

Is there a moment at Altri that has stood out for you? Can you explain?

The 50th anniversary of Celbi marked a significant moment in my time with the company. Over the past years, Altri has undergone a metamorphosis, transforming from a set of distinct companies into a group with common goals. However, you can sense that the different individual cultures of the companies all contributed to what Altri's culture and values are today.

How do you see the future of the company?

I look to the future with confidence. The group has demonstrated over the past years the necessary adaptability for success. We feel obligated **to be part of the solution to the challenges our society faces**. Once again, we must reinvent ourselves. And once again, the solution can be based on the energy that drives us.

GUALTER VASCO, Director of Digital Transformation and Asset Management at Altri

Read the full article on page 08.