KALUNDBORG
REFINERY

Sustainability Report

2022

Content

Name and location
Kalundborg Refinery A/S
Melbyvej 17
DK-4400 Kalundborg
Tel. 59 57 45 00

Visiting address
Melbyvej 10
DK-4400 Kalundborg

CVR no.
29975884
P-unit
1.012.707.823

Industry
Refining of mineral oils

Company list entry
List item 1.2 in Annex 1
Refining of mineral oil and gas

Environmental inspection authority
Environmental Protection Agency Businesses

Environmental approvals
Reassessment of environmental approval and authorisation for direct discharge of wastewater for: Kalundborg Refinery A/S.
Dated 20 December 2013.

Single environmental permit for the refinery.

Directorate
Wouter de Jong

Board of Directors
Allan Edward Gary Klesch
Jürgen Wollschläger
Jesus Tamara Velasco
Joseph Zammit Tabona
Niels Bech
Mikkel Pagh

About the Sustainability Report 2022

The purpose of this report is to inform authorities, neighbours, employees and other possible stakeholders about the activities of the refinery during the year 2022. At Kalundborg Refinery, we are aware that our activities affect our surroundings and therefore, we have a strong focus on operating the refinery in an environmentally responsible manner. We are continuously working to reduce our emissions and create a greener product portfolio to deliver the products that the market demands.

The sustainability report has been prepared on the basis of the reporting requirements in Section 99a of the Danish Financial Statements Act. In addition, the report includes a verification statement from the independent auditor DNV, which has audited the environmental data and environmental and energy targets provided.

With the sale to Klesch Group on 1st January 2022 came a number of internal changes. The culture and people at Kalundborg Refinery remain the same and therefore, the sustainability report will continue to focus on topics such as: Safety, well-being, environment and competitiveness.

The 2022 Sustainability Report begins with some words from the company's Managing Director, Wouter de Jong, followed by basic data and an introduction to the company. Finally, there is a section on the refinery's sustainable activities and specific environmental targets and data.

Words from the Managing Director

As the largest refinery in Denmark, Kalundborg Refinery is one of the cornerstones of the country's security of supply and mobility. For more than 60 years, the refinery in Kalundborg has supplied energy to Denmark. But Denmark as we know it, is in the midst of a green transition, and it is our ambition to become a large-scale supplier of green fuels in the future.

The serious situation in Ukraine has shown us the importance of refineries in terms of security of supply in Denmark. At Kalundborg Refinery, we work every day to ensure a stable and safe production of petroleum products for society.

The supply situation has created higher volatility in the global energy markets we navigate in. We must be adaptable and have a continuous focus on optimising our processes and products.

On 1st January 2022, Klesh Group took over the refinery and the terminals in Kalundborg and Hedehusene. 2022 has been a year with many new initiatives, hard work, and new ways of working.

At Kalundborg Refinery, our dedicated and competent employees are the reason our company is successful today and can achieve its goals in the future. In 2022, we have welcomed more than 60 new employees, and we look to a future where our company will continue to grow.

The refinery is part of a highly competitive market and therefore, we are continuously working on value creation, new digital tools, as well as our commercial mindset and product portfolio.

In 2022, we introduced an internal improvement programme, which we call "Take-off". The aim of the programme is to improve the refinery's performance and establish a competitive, autonomous organisation after being part of a large group with central support.

At Kalundborg Refinery, we work to deliver the energy solutions that the market demands. The ambition to make Kalundborg Refinery one of the largest producers of green fuels in Denmark can only be achieved under the right conditions.

The refinery plays a key role in the green transition in the transport sector, including heavy-duty transport, ships, and aircraft. In the future, hydrogen and CCU will gradually replace crude oil, transforming Kalundborg Refinery into a Power-to-X (PtX) megafactory that can take the production of green fuels and green heat to a new level.

Safety remains our top priority. At Kalundborg Refinery, we have high ambitions for our safety performance, and we work with preventive activities to contribute to a high safety understanding and good safety behaviour among our employees.

During 2022, the refinery has again reduced its impact on the environment. We work continuously and proactively on environmentally responsible operations to limit our emissions to the environment. We continue to strive to be among the most energy efficient refineries and continuously introduce energy reduction measures that reduce CO_2 emissions.

Best regards,

Wouter de Jong

Wouter de Jong
Managing Director

About the Refinery and Terminals

The refinery in Kalundborg is Denmark's largest and processes up to 5.5 million tonnes of crude oil, condensate and blended product every year. At the refinery, we produce propane, naphtha, petrol, diesel, heating oil, and fuel oil.

In addition to the refinery in Kalundborg, the company also includes tank and port facilities, as well as two fuel truck loading terminals located in Kalundborg and Hedehusene. The terminals supply petrol and diesel to large parts of Zealand.

All crude oil and condensate are transported to Kalundborg by tankers, and much of the finished products are transported in the same way. Our port facilities are connected to the refinery, and we have around 500 shipping movements every year.

DID YOU KNOW THAT...

We have over 2,500 kilometres of pipeline, which corresponds to 25 trips from Kalundborg to Copenhagen.

Part of the Klesch Group

When the refinery in Kalundborg was sold in 2022, we joined the Klesch Group, which mainly specialises in the production and trade of oil-related products.

The Klesch Group has extensive industry experience, a broad product portfolio, and a continuous focus on risk management, which enables the company to deliver good results in a constantly evolving market.

For many years, Kalundborg Refinery has been a value-based company which remains the case after the change of ownership to the Klesch Group.

At Kalundborg Refinery, we have four values that guide our decisions, actions, and the way we work together.

With the acquisition by the Klesch Group, we also gained a so-called sister refinery, Raffinerie Heide, located in northern Germany. In 2022, we have had a strong focus on establishing a good collaboration with our colleagues in Heide, which has had a positive influence on the exchange of experience and ideas between the two refineries.

The refinery in Heide, which has been part of the Klesch Group since 2010, is among other things, a mobility and heat supply partner in Northern Germany.

Every year, the refinery processes more than four million tonnes of crude oil, and its production of aviation fuel covers almost all flights departing from Hamburg Airport. In addition, the refinery's production of heating oil ensures that 250,000 households in the area between Flensburg and Hamburg receive the heating they require.

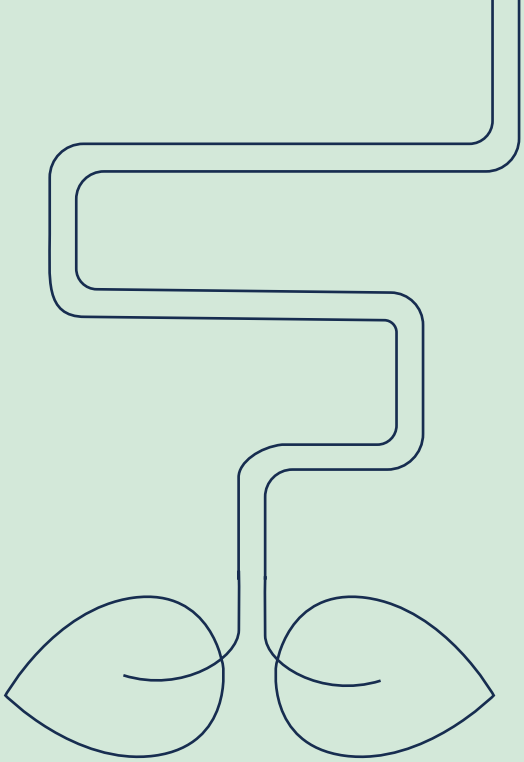
For me, an attractive workplace is a place where there is a good atmosphere with a good team spirit, mixed with the opportunity to develop your skills. Since the acquisition by the Klesch Group, we have seen a significant change in the way we work. Among other things, we have integrated the Accounts Payable Department in-house, which gives us a better understanding of the processes. This has given us some significant advantages.

We have established a good working relationship with our colleagues in London and Geneva. It has been extremely helpful during the transition period, and the first year as part of the Klesch Group has been exciting and full of change.

Looking forward, it is important that we optimise our processes and have the right controls in place. Furthermore, we need to increase ownership of our costs and ensure the right investments to secure the future of our refinery.

Majken Ljungdahl Pettersen, Finance Department

Our Core Values

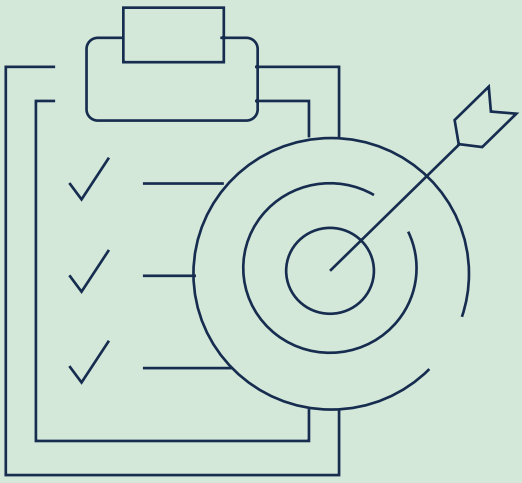


Adaptability

Our quick decision making gives us the ability to adapt to change in pursuit of opportunities that generate value and of continuous improvement.

Innovation

We challenge accepted practice to find better ways of working to generate further value.



Discipline

We apply discipline and diligence to running our business and to investing via in-depth insight and risk assessment. Our people have extensive sector industry expertise and a passion for operational rigour.

Accountable

We take responsibility for our actions and do what we say we are going to do.

The Way We Work

At Kalundborg Refinery, we work in four main areas, each of which aims to maintain high safety standards, develop the company commercially, and ensure our robustness in a highly competitive market. The four main areas are **our attractive workplace, the green agenda, safety, and competitiveness.**

Attractive workplace

Our nearly 400 employees are crucial to our future ambitions. We create attractive working conditions in an informal organisation, where you are given a lot of responsibility in your job early on. High welfare, openness, and trust in collaboration with one's colleagues are the essence of the way we work. The complexity of the company provides great opportunities for job development both professionally and personally.

Green agenda

We have an ambition to contribute to the green transition and a sustainable future. We are working to make energy efficient and maintain environmentally responsible operations as well as ensure the development of more green products.

INNOVATION, ADAPTABILITY, ACCOUNTABLE AND DISCIPLINE

Safety

Safety is our main priority, which is reflected in all our activities. We want to create a proactive safety culture, high technical integrity, and a strong security culture.

Competitiveness

Our commercial focus is to ensure the maximization of cash flow in an increasingly changing world (with associated fluctuations in supply, demand, and pricing of our products). Our operations must be continuously optimised based on market insights, and we must be adaptable so that we can always get the best out of our assets. Our product portfolio must be future-proofed through new methods and technologies so that we can offer the products that the market demands – also in the future.

Our contribution to the 17 UN Sustainable Development Goals

We support the 17 United Nations Sustainable Development Goals (SDGs). The SDGs set the course for more sustainable development for people as well as our planet. We are focusing on three goals in particular, for which we are trying to raise awareness when it comes to the environment and the green transition.

Goal 3:
Good health and well-being

We have activities aimed at promoting the health and well-being of our employees.

Goal 7:
Affordable and clean energy

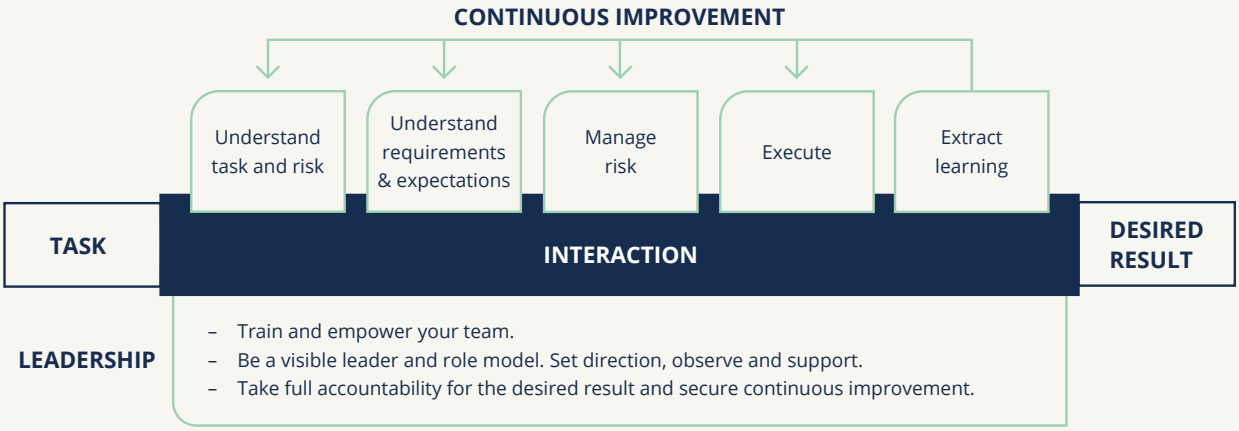
We are working to improve energy efficiency and eventually introduce greener energy sources.

Goal 12:
Responsible consumption and production

We aim to use as few natural resources as possible and reduce the impact on the surrounding environment.

Compliance and leadership

At Kalundborg Refinery, we work systematically to manage risks and ensure efficient and safe operations. The model below is divided into five steps, each of which contributes to the desired and satisfactory outcome of all tasks. In addition, the outcome is evaluated so as to ensure learning.



Attractive Workplace

Being an attractive workplace is a crucial factor if a company wants to compete for skilled workers. We have been aware of this for many years, especially in our first years as Kalundborg Refinery. The value generated during this time from having an exciting place of work at our two terminals, in Kalunborg and Hedehusene, was very clear.

Our motto when recruiting new colleagues is that "you will have the opportunity to get close to the process". We mean this quite literally, because our production, our technical support, and our staff functions all have a stake in our success in creating value for the company while maintaining a high focus on safety. On a day-to-day basis, we run a top-class refinery, which is only able to operate around-the-clock because of our skilled and competent employees.

We strive to train our new colleagues, but also to develop the employees who are already part of our workplace.

A refinery is a very complex workplace, where many professionals work together across their disciplines and organisational locations. Through close cooperation, we can secure the production of oil products for society and supply energy to Denmark, Sweden and other European countries. This is why we strive to ensure that our employees feel they can develop professionally with interesting tasks. We try to create an environment which encourages curiosity and learning in the best possible way.

In this way, we believe we can help our employees reach their full potential and make the best use of their skills. For example, we have developed and tailored our own refinery technician training over many years. You can recieve this training as an apprentice, where you undertake a four-year apprenticeship, or through in-service training, if you have a background as an artisan. We believe that the training we have developed for the process industry is first class.

"As an apprentice, Kalundborg Refinery is an attractive workplace because I have skilled colleagues with whom I can work closely and learn a lot from. In general, I find that there is a strong focus on learning from the employees at the refinery, which is a rewarding environment to be a part of as an apprentice.

At the same time, as an apprentice, I am given responsibility and I have been allowed to be part of the latest routine shutdown, which was tough, but also an experience I learned a lot from."

Lucas Cebulla, Warehouse and Logistics Apprentice

In addition to our training in the process industry, we have many other career opportunities in our company, and we believe that diversity is a strength. We are very proud of our many experienced and innovative teams of professionals, specialists, and managers in areas such as technical engineering disciplines, maintenance, projects, process engineering, safety and environment, IT, and administration. Below you can see an overview of some of the different professions and functions that can be found at Kalundborg Refinery.

JOB OPPORTUNITIES AT KALUNDBORG REFINERY

Staff: Finance

Financial Controller
Deal Handling Specialist
Accountant
Tax Specialist
Head of Controlling
Legal Counsel

Staff: HR & Communications

Payroll Specialist
Talent Attraction & Administrative Specialist
HR Partner Union Relations
HR Partner Development
Team Lead HR Administration & Payroll
Communications Specialist

Health, Safety & Environment

Energy Engineer
Environmental Engineer
Chemical and Waste Management Responsible
Safety Leader
Product Quality Coordinator
Process Safety Management Coordinator

Operations

Field Operator
Panel Operator
Shift Leader
Terminal Technician
Loading Master
Process Plant Engineer

Technology & Commercial Optimisation

Process Control Engineer
Application Engineer
Production Planning Leader
Technical Safety Engineer
SAP Specialist
IT User Support

Project, Procurement & Control

Project Leader
Strategic Procurement Specialist
Project Execution Leader
Administrative Assistant
Project Scheduler
Project Quality & Risk Controller

Technical Integrity & Maintenance

Refinery Technician Mechanical
Engineer, Mechanical & Civil
Engineer, Rotating & Valves
Terminal Technician
Engineer, Electric & Instrumentation
Supervisor

2022 - a year of great change

During 2022, Kalundborg Refinery has undergone a major transformation from a subsidiary of the Equinor Group to an independent, efficient and competitive refinery. In particular, three major changes have affected our task focus in 2022. One of the major tasks in 2022 was to establish a stand-alone IT solution containing all the IT applications that support the business. Next, we carried out a large, routine shutdown called TA2022.

TA2022

TA2022 is a routine shutdown of the facility for maintenance and inspection.

Commonly referred to as Turn Around or TA.

Under TA2022, a number of inspection and maintenance tasks were carried out, including new and innovative solutions. Finally, we ended the year with the implementation of a new and adapted organisational structure that supports our transformation into an independent and commercial refinery.

Because of all these changes, we have had a need to recruit many new colleagues in 2022. Our numerous new colleagues have strengthened the entire organisation, and several have joined us in building entirely new departments.

We welcomed more than 60 new employees at Kalundborg Refinery in 2022.

In order to hire 60 new employees, we have held many recruitment interviews throughout the year, which have made it clear that Kalundborg Refinery is an attractive workplace.

Our new colleagues have been motivated and excited by the opportunities to collaborate across different professional groups and to influence the working methods of the company.

We identified more than 70 improvement projects during our first year as Kalundborg Refinery, and they have all been integrated into our new improvement programme, which as previously mentioned, is called "Take-off". This also meant that many employees had the opportunity to combine their respective tasks with improvement projects, which opened many new learning and development opportunities in the organisation.

Specifically, the management at Kalundborg Refinery chose to establish a graduate programme, where three newly graduated academics were hired to support the numerous change projects underway in the organisation.

In 2023, we also want to strengthen the organisation with more graduates, and we will continue to recruit new apprentices within process, the mechanical and electrical workshop, and IT. In addition, in 2023, we will continue to have a strong focus on recruiting more employees in many of the functional areas at the refinery. This growth in numbers of new employees is mainly because we are experiencing a generational change, where colleagues who have worked at the refinery and terminals for many years are now retiring. Many of our employees have been with us for years. We believe this is a result of a good working environment, where our employees have a strong sense of belonging and feel acknowledged for their work.

We have big ambitions to retain employees, despite having a new owner, a new name and a new brand, not to mention numerous new colleagues joining our team.

Here it is important to highlight our staff association "Raff Sport & Kultur", which has existed since 1963 and celebrates its 60th anniversary in 2023. The association is run by an elected voluntary board of directors, which organises various sports and cultural activities to the great satisfaction of its members. Activities are funded by a grant from the company, a modest membership fee, and a small personal contribution depending on the current activity. A range of sporting activities, such as badminton, crossfit, shooting, and yoga, are available for employees to sign up to. For the cultural events, families can be invited to participate in, for example, a cinema or theatre trip, skiing trip, bingo, travel, Christmas tree party with gifts for the children or excursions to the "put and take" fishing lake, the Forest Tower and many more. The association's activities and events are wide-ranging and provide excellent opportunities for socialising across the organisation, which is very beneficial for the employees.

The refinery's awards

Every year, Kalundborg Refinery awards two prizes. The Condensate Award is awarded to celebrate a local enthusiast. Whether it is an association or an individual that, through their work, has specifically promoted sporting or cultural activities. For example, this could be through the organisation of sporting or youth activities in Kalundborg Municipality. In 2022, the Condensate Award was awarded to the Lions Cup association. Lions Cup has organised youth football events in Kalundborg 38 times. The Lions Cup received the Condensate Award in recognition of the great work done by the many volunteers for the benefit of young people in the local community.

The second annual award is our technical award, which after the change of ownership is called the Kalundborg Refinery Prize. In 2022, the prize was awarded to Associate Professor Pooya Davari, researcher in power electronics. Pooya Davari has shown a great understanding of this technical phenomenon, while at the same time managing to focus on the perspectives of application.

The local environment and learning are high on the agenda

Learning and development of human potential is a top priority at Kalundborg Refinery. This applies both internally and externally. The cooperation with the local community is high on our agenda, and we want to be visible to private citizens, other companies, organisations, associations, and educational institutions. Therefore, we hold annual meetings for our neighbours and our pensioners' association, who are informed about the refinery's environmental performance and activities over the past year. In addition, we have the possibility to contact neighbours through an SMS solution, where they can be informed about relevant operational activities and interruptions.

The refinery supports local activities aimed at making Kalundborg an attractive place to live, work and study. For example, we work closely with local educational institutions to recruit apprentices, student workers, and trainees. We collaborate with the Helix Lab Research and Education Center, which aims to attract graduate students who can carry out thesis projects in collaboration with industry in Kalundborg. Kalundborg Refinery also has a seat on the board of directors of Helix Lab.

Additionally, Kalundborg Refinery is part of the Biotech City, which is a partnership where local companies, educational institutions and public organisations work together to strengthen the city's industry, educational opportunities and collaboration on the green transition.

Code of Conduct

The refinery adheres to high ethical standards with the aim of creating a trust-based relationship between the company, owners, partners and our local community. We are committed to creating an inclusive and diverse working environment with equal career opportunities for all, respecting differences in experience, skills, age, gender, education, ethnicity, sexuality, religion, and political beliefs.

Our Code of Conduct is our living expectation that we have of everyone who works at and with Kalundborg Refinery. In our Code of Conduct, it is clearly stated that we do not tolerate any form of corruption or breaches of internationally recognised human rights. In our view, the greatest risk related to human rights and corruption lies with suppliers, in terms of non-compliance with our Code of Conduct.

Our company complies with applicable legislation in all business activities and focuses on acting in an ethical and socially responsible manner. This is reflected in the agreements we make with our staff, consultants, and local and international suppliers.

We have not experienced any breaches of compliance with our Code of Conduct in 2022, neither internally nor with our suppliers. Our ambition is to continue to actively use our Code of Conduct and to create an open dialogue about potential improvements in this area.

I am a graduate engineer in biotechnology from University College Absalon in Kalundborg. During my studies, I was a student assistant and apprentice at the refinery, and I also live in the local area.

When a vacancy for an environmental engineer became available due to retirement at the HSE Department, I had to seize the opportunity. As an environmental engineer, my responsibilities include environmental technical support and follow-up on our environmental permit.

The HSE Department and refinery has been and still is an amazing place to work, full of experience, inclusiveness and people who care about each other. In my experience, the greatest strength of Kalundborg Refinery is the people who work here.

Emma Jensen, Environmental Engineer

Always Safe

Safety is our top priority. Everyone working for the refinery and terminals is responsible for safety and security. We are each responsible for ensuring that our actions live up to this commitment every day.

> **We work safely, otherwise we do not work**
>
> *Wouter de Jong, Managing Director*

From a safety perspective, 2022 has been a year of many activities and mixed results. The safety results are dominated by the performance of a major shutdown, TA2022.

In 2022, we have had two actual and one potentially serious incident. The two actual serious incidents involved a serious injury when disembarking a tractor and an incident involving a serious leak when starting up a heat exchanger following TA2022. The potentially serious incident occurred during TA2022, when a 65 millimetres, 5.5 kilograms spanner fell from a height without causing injury or damage to people or property.

3.0 SIF
2022 serious incident frequency rate (number of potential and actual serious incidents per million working hours)

9.0 TRIF
2022 injury frequency (number of medical treatments and/or absences per million hours worked)

It is positive that the injury did not result in permanent disability and that the leak was captured by our barriers and thus did not have a negative impact on the environment and surroundings. The three serious incidents correspond to a serious injury frequency (SIF) of 3.0, which is an unsatisfactory safety performance compared to our target of zero serious incidents or potentially serious incidents. It is also an unsatisfactory result compared to 2021, when we had a serious injury frequency (SIF) of 1.2.

In 2022, we have had nine injuries, which form the basis for our TRIF (Total Recordable Injury Frequency) of 9.0. The injuries consist of one incident involving medical treatment and eight involving absence/ alternative work. Four of the injuries occurred during TA2022. We are not satisfied with this result, which is worse than our target of a maximum of four injuries and also worse than the 2021 TRIF of 6.2. However, the result is better than the 2020 result, where we had ten injuries.

We want to learn from our incidents to avoid similar ones happening in the future. Therefore, we have followed up on the incidents closely and put solid measures in place to avoid similar incidents.

The last five years of serious incidents and injuries show a mixed record. The results also show that we can perform better.

Year	2018	2019	2020	2021	2022
Serious actual incidents	0	1	2	0	2
Serious potential incidents	0	2	0	1	1
Number of medical treatments and/ or absences	10	1	10	5	9

We strive for good, stable safety results, and due to this we have several preventive activities to help us achieve a high level of safety awareness and good safety behaviour.

For many years, we have been sharing lessons from incidents within the organisation, and as a new feature in 2022, we have regular learning meetings with our German sister refinery in Heide. During these meetings, we share investigations and lessons from incidents with each other.

In 2022, we introduced **safety topic of the week**. It is a topic discussed at a weekly safety meeting with operational managers and subsequently shared with all departments and suppliers. The purpose of the safety topic of the week is to highlight a relevant safety topic and also to train colleagues and suppliers on the chosen safety topic.

In our **safety timeouts**, we work on increasing the understanding of personal and process safety by reflecting on selected safety topics. In 2022, all departments, as well as our regular suppliers, have completed two safety timeouts on the topics shown in the figure below.

Time/target group	Starting point	Theme/question
1Q 2022 All including regular suppliers	Transition and change process due to change of ownership	• Risks related to change of ownership • How to avoid injuries and serious incidents in a transition • Compliance with governing documentation in a transition
Summer 2022 All including regular suppliers	TA2022	• What is your role during TA2022 • Contribution to avoiding incidents • Departmental preparations before TA2022

In 2022, we have put **greater focus on process safety** via the activities below.

The focus will continue in 2023, when the processes will be fully developed and implemented.

We hope that 2022 was the final farewell to the additional COVID-19 restrictions that the refinery has had in place to ensure safe and stable operations.

Our additional restrictions were lifted on 4th of April 2022, and the refinery has been following the authorities' applicable guidelines since then.

Major accident workshops	We have held major accident workshops where our employees have been trained to understand the risks of major accidents. This activity started in 2021 and was completed in 2022.
Follow-up on incidents	We have improved the system we use for reporting and following up on incidents so it is now possible to follow up specifically on process incidents. In 2022, a total of 82 process-related incidents were recorded, of which 41 are injuries and 41 are inflows or conditions.
Compliance Officer	We have created a new position of Compliance Officer, who is responsible for good processes and practices in process safety, change management, incident learning and data protection.

We recognise good safety behaviour by awarding **the month's safety award.**

The award is given to an employee or a supplier's employee who has demonstrated particularly good safety behaviour. Anyone can nominate a person, after which health and safety representatives from Kalundborg Refinery and supplier companies choose the recipient. In 2022, the month's safety award was awarded for 10 months. There were no nominations for two months due to summer holidays and focus on TA2022, respectively.

The month's safety award is awarded to employees who have demonstrated exceptional safety behaviour or have contributed with safety improving measures.

My work as a Process Operator is out on the production site. Here, I carry out tasks where safety is the primary focus. As an operator, during observation rounds, I check the equipment is working and it is running properly. Much of our work is about prevention and ensuring that production operations can be carried out safely, thereby reducing the risk of incidents.

From my first day at the refinery, there has been a focus on safety and employee development. Training as a process Operator is a longer process where you specialise in parts of the production site. My personal development as an Operator on site is definitely not over.

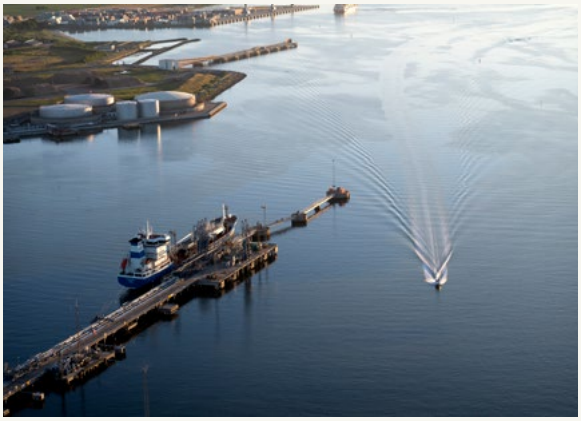
I have recently taken up the position of Health and Safety Representative, where I have been given the opportunity to further develop my skills and become a better operator. It has also meant that I can create a safe and secure working environment for my colleagues.

Michael Stephansen, Process Operator

Climate ambitions

We are part of the government's ambition to reduce total CO_2 emissions by 70% by 2030.

We look for greener solutions and seek to influence local, regional and national policy decisions through communication and dialogue on our green transition agenda.



Kalundborg Symbiosis

We are part of the world's leading industrial symbiosis, located in Kalundborg. The symbiosis creates sustainable development in Kalundborg's companies through joint projects. For the symbiosis, sustainability is a long-term and responsible use of our resources in balance with economic, environmental, and social considerations.

Kalundborg Symbiosis is a partnership between private and public companies located in the city. At the end of 2022, the symbiosis had 15 members.

Through Kalundborg Symbiosis we get access to boiler feed water, bio natural gas, flue gas condensate, cooling, and surface water. We contribute with heated cooling water, which we send to Ørsted for steam production. We also provide fertilisers for agriculture.

Kalundborg Symbiosis celebrated its 50th anniversary in 2022.

Drivkraft Danmark

We are a member of Drivkraft Danmark, which is our trade organisation. The sector accounts for 99% of the energy used in road transport and 40% of total Danish energy consumption.

Drivkraft Danmark is an employer and trade organisation for Denmark's fuel suppliers and charging operators. Drivkraft Danmark extends the green transition out to motorists and the transport sector, with two refineries and over 2,200 petrol stations, charging stations and trucking facilities across the country.

Refineries play a crucial role in the transition of heavy-duty transport, aircraft, and ships. As the last link in the PtX value chain, refineries help make green energy practical where it is needed. But the challenge to ensure this role is having a long-term and stable framework.

Jacob Stahl Otte, CEO of Drivkraft Danmark

Reduce Emissions

Kalundborg Refinery is Denmark's largest refinery, and our operations result in many different types of emissions, which we are constantly trying to reduce. The production of fuels by refining mineral and bio-oil is a very energy-intensive process, and the associated operational facilities have an impact on the surrounding environment, including air and water emissions, noise, and waste.

We have a strong focus on environmentally responsible operations and have been working on sustainable solutions to reduce emissions for many years. One of our major focus areas is production using fewer resources, which will reduce CO_2 emissions and thus the refinery's climate impact.

Each year, management sets goals for environmental, energy and quality improvements with reference to our certified management system. The goals are in addition to the refinery's regulatory requirements, set out in the environmental permit.

The results of some selected targets are presented at the end of this section, and the new targets for 2023 are presented as well.

The refinery actively participates in the Kalundborg Symbiosis, where a number of Kalundborg's companies utilise each other's residual products, so that a residual product from one company becomes a resource for another. The refinery contributes with cooling water and liquid fertiliser, which are produced from sulphur in the refinery gas. We receive cleaned flue gas condensate from Ørsted and use it for boiler feedwater, saving boiler feedwater produced in-house and reducing chemicals, raw water and energy for in-house production.

Energy consumption, energy optimisation and CO_2 reduction

Refining crude oil into petrol, diesel, heating oil and other products requires large amounts of energy, and this is also reflected in the refinery's air emissions, which can be directly related to energy consumption.

The separation and refining of crude oil/condensate into the finished products is done by a myriad of heating and cooling processes. The crude oil is pumped from large storage tanks through a heating system consisting of heat exchangers and furnaces to an atmospheric distillation column, where the first fractioning into gas, naphtha, kerosene, etc. takes place. Subsequently, a number of value-added processes are carried out in various processing plants to produce the products demanded by the market.

The refinery has a total of 14 furnaces of different sizes with a total installed capacity of 370 MW. The furnaces are fired with fuel gas, which consists mainly of the lightest fractions of the crude oil. Fuel gas is the largest fuel source at around 85-90%. Steam is also used to heat and treat the oil fractions and to operate turbines. Electricity is used to run pumps, compressors, air coolers, lights in the plant, etc.

The steam is produced at its own steam plant, which consists of three large boilers with a total installed capacity of 57 MW. The boilers can be fired with gas or diesel, with diesel being the fuel used in 2022 due to the gas prices as well as the uncertain supply situation at the beginning of the year due to the war in Ukraine and Russia's gas supply to Europe.

However, the steam produced by the boilers represents only about 30% of the refinery's steam consumption. The remaining 70% is produced from waste heat from furnaces and process plants.

In connection with TA2022, we carried out a project where we implemented a new type of heat exchanger for the refinery, called Compabloc. The implementation of this type of heat exchanger is an energy optimisation measure. It has been exciting to follow along and see how a completely new type of equipment, with which we had no experience, would work.

It turned out that there was no cause for concern, as both the commissioning of the Compabloc exchangers and the subsequent operation in normal service after start-up went as planned.

Finn Høgholm Jonassen, Head of Operational Support

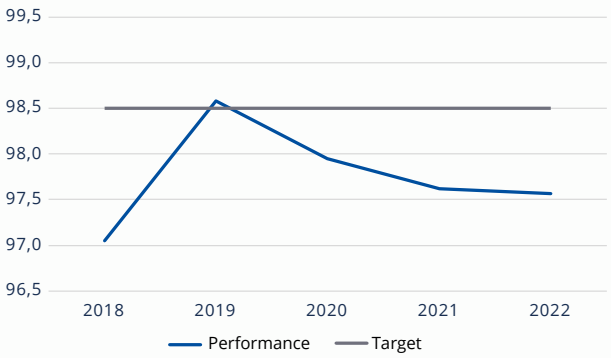
Type of energy	Percentage of energy consumption	Primary use of the energy type
Fuel gas*	85.7%	Firing in furnaces for heating crude oil. A total of 14 furnaces with an installed capacity of 370 MW.
Steam	7.7%	Heating/heat exchange, stripping/separation of oil fractions and operation of turbine pumps.
Electricity	6.6%	Operation of pumps, compressors, air coolers, facility lighting, control system, server room ventilation, etc.

** Light fractions of gas, residues from crude oil refining.*

The refinery has always had a strong focus on energy optimisation, and CO_2 emissions are continuously reduced by reducing the consumption of fuel gas.

In the furnaces, heating is controlled with as little excess oxygen as possible within safety measures, reducing fuel gas consumption and emissions. A target has been set for the oxygen surplus, which has remained constant in recent years, as the target is difficult to meet even with just a few operational irregularities. In 2022, the target has not been met, even though the operating organisation has had a high focus on governance. The reason why some furnaces still exceeded the limit may be due to fouling, weather conditions, and minor leaks in the furnaces, allowing false air to be drawn in.

Compliance with maximum oxygen % during operation



In addition, targets for maximum flaring and energy efficiency are set annually and are part of our certified energy management system, cf. ISO 50001.

The refinery has two flares, which always burn with a small flame. They are vital for depressurising the plant when there are operational disruptions and planned shutdowns of parts of the process plant. The flares are therefore part of our safety system.

The operating organisation has a strong focus on reducing unnecessary flaring, and daily follow-up has resulted in a significant reduction in the amount of flaring over time. Emissions in 2022 were significantly lower than the maximum target set, again demonstrating the impact of good governance. The target was set relatively high to reflect our expectation of increased flaring during shutdown and start-up of the process plant in connection with TA2022.

In day-to-day operations, there is also a focus on reducing electricity and steam. A number of automatic process optimisation controls have been developed to help provide an overview and trim the processing plant to maintain product quality while reducing energy consumption.

DID YOU KNOW THAT...

The refinery's electricity consumption corresponds to the electricity production of 22 wind turbines.

3 MW wind turbines similar to those at Lerchenborg Gods.

In addition to the ongoing operational energy optimisations, plant modifications and equipment replacements will also be carried out, which contribute to energy reductions in fuel gas, electricity, and steam.

Optimisation of the refinery's heat exchangers is one of the focus areas, as internal studies of the heat exchanger configuration have revealed a significant savings potential. Based on the studies, two major projects have been planned so far, and another study is planned for 2023 to identify further optimisation opportunities.

2022 led to a number of changes for the refinery in connection with the acquisition by the Klesch Group. Among other things, this meant that I took the position as Director of Business Development. There is a particular focus on promoting the green transition. Green hydrogen, district heating from waste heat and bio-based fuel production have been some of the hot topics in the past year.

At Kalundborg Refinery, we are constantly trying to think in new directions, so that we can be part of the transformation to greener energy, both nationally and internationally. Our participation in the Danish Energy Agency's CCS tender is a good example of this.

Throughout 2022, I have participated in several partnerships where we have been working with other actors to build alliances that benefit both the climate and the participants. This year, the focus areas have included hydrogen infrastructure in Denmark, production and integration of green hydrogen at the refinery, as well as production of low-aromatic aviation fuel.

Niels Bech, Director of Business Development

Reference for "DID YOU KNOW THAT...": https://videnomvind.dk/wiki/arlig-energiproduktion-fra-en-vindmolle/


1362


KALUNDBORG
REFINERY
Kaj A. Christensen
3M
TEGERA

By 2022, one project will be completed with the installation of a new type of heat exchanger that is more energy efficient than the existing ones.

The new plate heat exchangers increase the preheating of the crude oil by approximately 3.5 MW, resulting in reduced firing in one of the large furnaces and at the same time reducing CO_2 emissions by approximately 6,000 tonnes/year. So far, we are very satisfied with the new heat exchanger design, and we are looking forward to the second project, which is roughly similar and will be implemented in 2024 in connection with the shutdown of parts of the refinery for cleaning, inspection, and maintenance.

Energy efficiency and green transition is the way forward for the refinery, as reduced fuel consumption leads to CO_2 reduction. As our new Director of Business Development, Niels Bech, says, we are examining opportunities for the use of green hydrogen, the supply of district heating from waste heat, CCS (carbon capture and storage), and the production of greener products for both cars and aeroplanes.

The refinery is already able to produce biodiesel with 12% bio content, almost double that of the normal diesel sold at petrol stations in Denmark. The more sustainable diesel is produced by co-processing, which means that the bio-component has to be refined in our processing plant, as conventional blending of bio-component above approximately 7% leads to deterioration in the quality of the diesel. The refinery is certified according to ISCC EU requirements, which is required if the products are to be marketed with a higher bio content. The higher bio content results in lower CO_2 emissions when the fuel is burned and has a lower environmental impact.

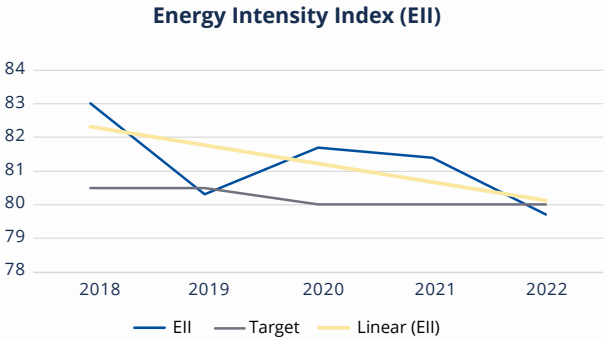
The energy efficiency of the refinery's total production is calculated according to the guidelines from Solomon Associates, which developed the methodology used by the refining industry. Several factors besides energy consumption have an impact on Solomon's Energy Index, such as the volume produced, the composition of the product mix, and process plant shutdowns.

DID YOU KNOW THAT...

The refinery's electricity consumption corresponds to the electricity consumption of about 100,000 people.

In 2022, the energy efficiency target was been achieved, which is very satisfactory. This is attributed to extraordinary cleaning of heat exchangers at the end of 2021 and a strong focus on operational optimisation and high throughput in the plant, especially in the spring. All other things being equal, a high throughput will have a positive impact on energy efficiency, as the base consumption of the installation has to be taken into account.

Notice that the lower the index number, the better the energy efficiency.



Solomon Associates conducts a large industry benchmark study every two years, with approximately 100 refineries participating and comparing their data. Kalundborg Refinery is typically among the top 10-15% of refineries with the lowest CO_2 emissions, relative to complexity and production.

Reference for "DID YOU KNOW THAT...": https://www.gasel.dk/vaerd-at-vide/hvor-meget-stroem-bruger-en-husstand

DID YOU KNOW THAT...

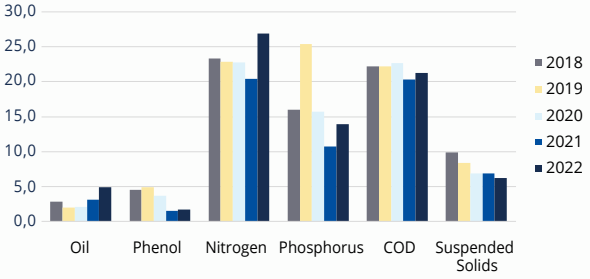
The refinery's CO_2 emissions correspond to the CO_2 emissions of about 70,000 people.

Wastewater discharge

The refinery has its own wastewater treatment plant, which is a combination of mechanical and biological treatment. The plant is specifically designed to treat the different types of wastewater, consisting of process wastewater, sanitary wastewater, and rainwater. The thorough treatment ensures a high quality of the purified water, which is discharged into Kalundborg Fjord.

The graph "Emissions to water environment in % of authority limit" shows that the discharge is far below the limit values set by the Danish Environmental Protection Agency, and the trend is decreasing for several parameters. However, more stringent conditions are expected when our new environmental permit is issued, likely in 2023.

Emissions to water environment in % of authority limit



The total quantities discharged can be found in the section "Environmental data" at the end of the report.

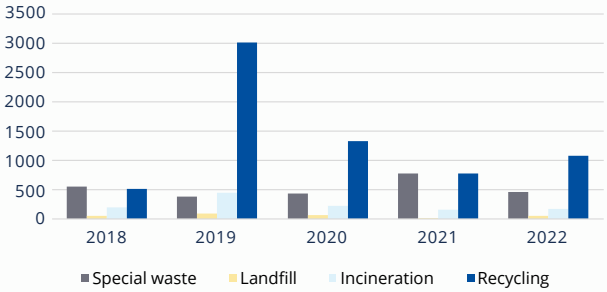
Waste fractions

We have a strong focus on waste sorting to ensure that as much waste as possible is sent for recycling. This requires a lot of attention from the organisation, as the requirements for sorting are becoming more and more differentiated. We are constantly working to raise awareness, especially when we have new workers at the refinery, for example during shutdowns like TA2022.

The large variation in waste volumes from year to year is due to our various activities, such as tank renovations, building demolitions, and shutdowns.

Waste is now considered a resource, and when waste is sorted for recycling, it becomes secondary raw materials that can replace essential raw materials in the production of new goods, benefiting the climate and the environment. The refinery's recyclable waste has thus saved the environment 755 tonnes of CO_2 in 2022, compared to 488 tonnes in 2021*.

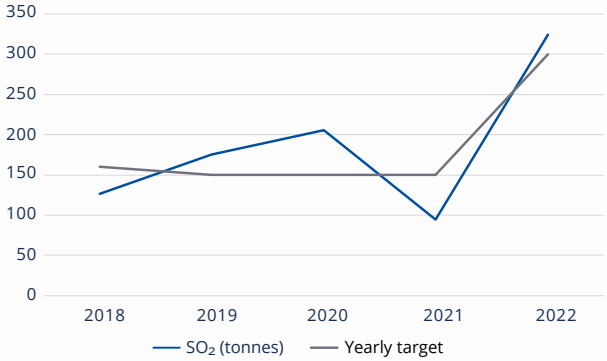
Waste fractions (tonnes)



As shown in the diagram, the total amount of waste has increased slightly in 2022 compared to 2021, due to TA2022. There are only minor changes in the different waste fractions, where as mentioned earlier, it is worth noting the increased recycling fraction.

Air emissions

SO_2 emissions (tonnes)



In 2022, the calculation methodology was changed, which has contributed to the higher emissions compared to previous years. You can find more information on this on the following page.

*Reference for "DID YOU KNOW THAT...": https://www.dst.dk/en/Statistics/themes/climate * Reference for waste – saved CO_2 calculated by our waste carrier: Basis for calculation of CO_2-savings is based on collected quantities of waste for the recyclable waste types for which CO_2 savings can be calculated according to the report "Action plan for circular economy - National plan for prevention and management of waste 2020-2032", cf. Table 2.6.1, prepared by the Ministry of Environment July 2021.*

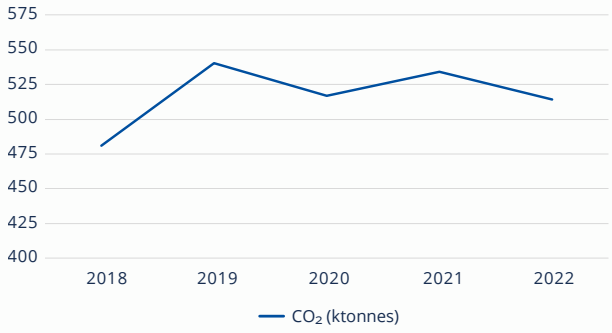
Emissions of sulphur dioxide (SO_2) are significantly higher compared to previous years, mainly due to a change in calculation methodology in 2022. Analyses of hydrogen sulphide content from a number of major and minor sources have been carried out in the past, and the analytical results have been converted to tonnes SO_2. With the new measurement principle, measurements are made in the BLOK1 smokestack, which contains flue gas from five furnaces. The flue gas content of SO_2, resulting from hydrogen sulphide, mercaptans, etc., is converted to standard dry flue gas. Other sources of SO_2, for example when the ATS facility is not in operation or is bypassed, are included unchanged in the SO_2 calculation.

The changed measurement principle results in an increase in calculated SO_2 emissions, which has been taken into account in the annual target.
The overshoot of the annual target is due to a change in the plan for TA2022, which resulted in a shorter period of use of sulphur fuel gas as the ATS facility was out of operation for inspection and maintenance.

The refinery's direct emissions of carbon dioxide (CO_2) come primarily from the combustion of fuel gas used to heat crude oil and the production of steam at the boiler plant by burning diesel or biogas/natural gas. Emissions vary from year to year, and although CO_2 emissions are continuously reduced, it can be difficult to see when production volumes fluctuate.

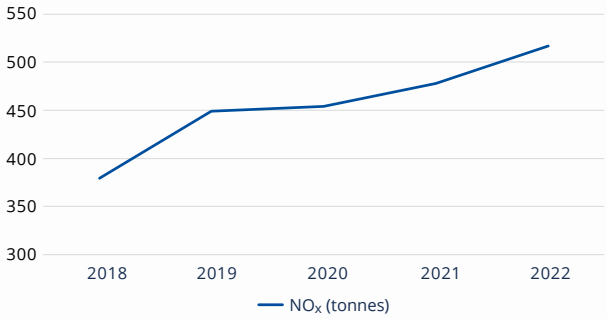
In 2022, emissions were slightly reduced due to both increased energy efficiency and slightly lower production volumes due to TA2022.

CO_2 emissions (ktonnes)



The refinery is covered by the CO_2 quota legislation and is required to measure and report CO_2 emissions to the Danish Energy Agency. Emissions must be verified annually by an accredited company, and the amount of CO_2 emitted must be reported to the Danish Energy Agency and entered in the quota register, where quota fees are paid.

NO_X emissions (tonnes)



In 2022, the calculation methodology was changed, which has contributed to the higher emissions compared to previous years. You can find more information on this below.

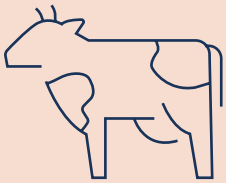
Combustion of gas and diesel also produces nitrogen oxides (NO_X) and emissions are almost linearly related to CO_2 emissions. However, this was not seen in 2020, due to a minor correction of our NO_X calculation models based on a verifying emissions measurement carried out in early 2020.

In 2021, the relationship was linear again. In 2022, a break in linearity was again observed, as the method of calculation changed. As for sulphur dioxide (SO_2), we have chosen to include the actual measurements from the BLOK1 smokestack of NO_X. The other sources are unchanged. The higher NO_X emissions in 2022 are due to a change in calculation methodology and the use of diesel as a fuel for steam production. Diesel produces higher NO_X emissions compared to gas as a fuel, which has been used in previous years.

DID YOU KNOW THAT...

The refinery's CO_2 emissions are equivalent to the emissions of approximately 130,000 cows.

One cow emits four tonnes of CO_2 per year.



Reference for "DID YOU KNOW THAT...": https://www.google.com/search?q=ko+and+co2&rlz=1C1GCEA_enDK1009DK1009&oq=&aqs= chrome.0.35i39i362l8.264504j0j1&sourceid=chrome&ie=UTF-8

Certified systems

The refinery complies with several standards for management, pressurised equipment and safety rules for electrical work/authorisation and biofuel production. The systems are all certified and verified by third parties.

- DS/EN ISO 9001:2015 Quality management system.
- DS/EN ISO 14001:2015 Environmental management system.
- DS/EN ISO 50001:2018 Energy management system.
- Quality management system for electricity according, cf. the guidelines of the Danish Safety Technology Authority (KLS).
- Work with pressurised equipment according to AT Order 1977.
- Manufacture of pressure equipment, cf. PED.
- ISCC certification for biofuel production.

Quality, environment and energy policy for Kalundborg Refinery A/S

- We are committed to complying with the quality, environmental and energy management standards DS/EN ISO 9001, 14001 and 50001.
- We comply with applicable laws and regulations and contribute to sustainable development in our field of business.
- Through high technical integrity and continuous development, we ensure the right quality of our products using the least possible amount of natural resources.
- We work to reduce the environmental impact of our activities and to prevent pollution through environmentally responsible operations.
- We monitor and ensure high energy efficiency, which helps reduce greenhouse gas emissions from our processes.
- We continuously evaluate and improve our performance.

Environmental events

In 2022, we had 19 incidents where the Danish Environmental Protection Agency has been informed. The breakdown of incidents is as follows:

- 6 spillages to the surroundings each very different in nature. All spillages have been internal at the refinery and none have had an impact on the external environment. Most spillages have occurred in tank sites, where there are good clean-up options. Typically, the contaminated soil is excavated and may be supplemented by mapping of residual contamination to identify further decontamination.
- 6 loads of petrol or reformate on the Pier without the use of VRU. There have been a number of operational problems with the plant, and due to various circumstances, it was decided to load without the use of volatile gas capture.
- 2 overloads of the wastewater treatment plant. In both incidents, the discharge of wastewater to the recipient was stopped, preventing a possible discharge to Kalundborg Fjord. One incident was caused by a special composition of ballast water received from a ship on the Pier, and the other was due to a lack of focus on inflow to the wastewater treatment plant in connection with the start-up of the plant following TA2022.
- 1 ATS facility outage due to failure of pilot gas burners.
- 1 minor outage of the continuous measuring system (AMS meter) in the BLOK1 smokestack.
- 2 oil films on water.
- 1 increased noise disturbance due to plant shutdown.

New environmental approval

For several years, the Danish Environmental Protection Agency has been working on a reassessment of our environmental approval, which includes conditions on the implementation of "best available technology" within the refinery industry. We have been alerted to some of the requirements, which means that several environmental improvements have already been carried out. For example, a major wastewater study has been carried out, which will form the basis for an extended analysis programme for discharged wastewater to Kalundborg Fjord. We have implemented continuous measurement of the flue gases CO, NO_X, SO_2 as well as dust from the refinery's largest smokestack. In addition, similar periodic emission measurements have been carried out on all the smokestacks at the refinery.

Currently, it is expected that the final environmental permit will be received in 2023.

Complaints

The refinery has received three complaints from neighbours in 2022.

In all 3 cases, the refinery has sent a text message to the neighbours about possible disturbance from the activities.

- 2 complaints concerned our tank renovation of tank 1373. One concerned disturbance from dust and noise, and the other was in regard to the information in the text message, which was considered inadequate as the renovation work went beyond the 3 weeks announced.
- 1 complaint concerned smoke from the refinery's fire training area, which for a brief period was lent to the West Zealand Fire Service for training of personnel.

The complaints have been followed up by contacting the complainant for clarification. It is very important for us to maintain a good relationship with neighbours and stakeholders and that all concerns are taken seriously and followed up.

Selected Objectives for Energy, Environment and Safety

A series of targets for the refinery's performance are set every year. The most significant environmental impacts are listed, assessed and prioritised according to their significance, after which the targets for the year are set. The targets are complementary to the refinery's regulatory requirements. Below is an excerpt of our targets with comments.

Environmental impact	2022 targets max.	Result 2022	Comments on 2022 targets		2023 targets max.	Comments on 2023 targets
Energy Index (EII)	80.0	79.7	Extraordinary cleaning of heat exchangers at the end of 2021 and a strong focus on operational optimisation and high throughput in the plant have contributed to good energy efficiency.		80.0	Unchanged – after cleaning the system in the autumn of 2022 and replacing some older heat exchangers with new ones with a more efficient design, energy efficiency is expected to be maintained.
SO_2 emissions (tonnes)	300	324	There has been a strong focus on the continuous operation of the ATS facility. The facility converts hydrogen sulphide into fertiliser. However, a new calculation methodology and a change to the originally planned shutdown (TA2022) has resulted in a slight overshoot of targets.		275	Stricter – in 2022 the target was exceeded, as production in the KCP was not taken into account during TA2022. In 2023, emissions are expected to be reduced since only a minor shutdown of the ATS facility for maintenance is planned.
Exceedances of monthly values for wastewater discharges	1	0	Good stable operation of the wastewater treatment plant, which receives wastewater from operations, buildings, and rainwater. Events at the end of the year did not lead to exceedances.		1	Unchanged – 2022 targets are met. It is not considered realistic to increase the target.
Number of oil and chemical spillages (persistent contamination >10 liters)	1	0	Attempts are made to clean up all spillages so there is no lasting contamination in the environment. By 2022, it was possible to clean up and remove all persistent contamination from spillages.		1	Unchanged – the target is very ambitious and it is not considered realistic to set it at zero.
Gas for flaring (tonnes)	5,000	3,045	Good focus on flaring management, also during shutdown and start-up of plant after TA2022. Against this background, it is now apparent that the 2022 target was significantly overestimated.		3,000	Stricter – the limit value is reduced as there are no major planned shutdowns of the plant. Only a minor de-coke of the plant is expected in the autumn.
Percentage of compliance with max oxygen % in 11 furnaces	98.5 (min.)	97.6	Unfortunately, the extensive focus on controlling the oxygen % has not been enough to meet the target, as some heaters have had excessive oxygen surplus during certain periods.		98.5 (min.)	Unchanged – target is a maintenance target, which ensures that the focus on governance is maintained.
Injuries per million hours worked (TRIF)	4.0	9.0	A total of nine injuries: One medical treatment without absence and eight injuries with absence/alternative work, which is an increase compared to last year's result. Four of the injuries occurred during the TA2022 shutdown.		4.0	Unchanged – no one should be injured at work.
Serious incidents per million hours worked (SIF)	0	3.0	Three incidents in total: Two actual and one potential incident, which is an increase compared to last year's result. One actual incident with non-permanent injury. One actual incident of leakage with no impact on the environment or surroundings. One potential incident involving a falling object with no damage or injury to people or property. Two of the incidents are related to the TA2022 shutdown.		0	Unchanged – we want no serious incidents.

Auditor's statement

The independent auditor's statement

To Kalundborg Refinery A/S' stakeholders

On 07.03.2023, we have systematically reviewed records, calculations and statements in Kalundborg Refinery A/S Sustainability Report for the year 2022 for compliance with the described measurement methods and basis of calculations, including the rules in executive order no. 1941 of 04/10/2021 (PRTR order).

Kalundborg Refinery A/S' management is responsible for the Kalundborg Refinery A/S Sustainability Report. Based on our review, DNV submits a conclusion about the section of the sustainability report covering the specified environmental data and environmental and energy targets.

Purpose and scope of the review

Our audit only covers the specified environmental data and environmental and energy targets.

We have conducted our audit in accordance with generally accepted principles and standards. The review is organized and carried out with the aim of being able to issue a conclusion with a limited degree of certainty.

After an assessment of environmental significance and risk, we have reviewed Kalundborg Refinery A/S' documentation and reported data for the refinery.

The review also includes Kalundborg Refinery A/S' system for collecting data, as well as Kalundborg Refinery A/S' own control / quality assurance of data, including the decision on the accounting practices used and an assessment of the overall presentation of the sustainability report.

During the audit, particular emphasis is placed on the data sources and the aspects of the data collection procedure that are assessed to be subject to a high risk of error, taking into account the risk management methods that are used to minimize the degree of uncertainty.

The review has included documentation, data, assessment of measurement methods, calculation models and, where possible, data is compared with the financial accounts and CO_2 reporting. During the review, interviews were conducted with management representatives and employees.

It is our opinion that the audit performed provides a sufficient basis for our conclusion.

Conclusion

In our review, we have not become aware of any circumstances that would question the credibility of Kalundborg Refinery A/S' Sustainability Report or matters regarding the stated environmental data and environmental and energy targets, nor conditions which dispute Kalundborg Refinery A/S Sustainability Report's compliance with the rules in the legislation regarding PRTR reporting as well as with the analysis and measurement methods described by Kalundborg Refinery A/S.

15-03-2023

Tommy Lund
Lead Auditor

Annette Kromann
Technical Manager


KALUNDBORG
REFINERY

Environmental Data

Energy		2022	2021	2020	2019	2018
Refinery gas (& oil) (1)	[tonnes]	161,644	178,624	168,014	182,573	156,824
	[MWh].	2,260,298	2,539,729	2,356,488	2,562,608	2,219,585
	[%]	85.7	88.3	87.3	88.1	88.0
Electricity	[MWh].	173,039	178,175	172,355	179,822	154,067
	[%]	6.6	6.2	6.4	6.2	6.1
Steam imported	[tonnes]	0	0	0	91,420	7,288
	[MWh].	0	0	0	79,091	6,305
	[%]	0	0	0	2.7	0.2
Natural gas for steam production	[tonnes]	1,659	12,485	13,136	6,580	10,841
	[MWh].	20,326	158,813	171,332	86,582	142,358
	[%]	0.8	5.5	6.3	3.0	5.6
Diesel for steam production	[tonnes]	15,572				
	[MWh].	184,275				
	[%]	7.0				
Total direct energy consumption	**[MWh].**	**2,637,938**	**2,876,717**	**2,700,175**	**2,908,103**	**2,522,315**
	[%]	100	100	100	100	100
Refinery gas (& oil) in % of throughput	[%]	3.8	3.7	3.7	3.7	3.5
Energy index, refinery (2)		79.7	81.4	81.7	80.3	83.0

Water		2022	2021	2020	2019	2018
Tissø water	[1,000 m³]	1,097	1,221	1,395	1,431	1,476
Town water	[1,000 m³]	52	49	33	27	31
Import of steam and boiler feedwater	[1,000 m³]	9	43	67	185	40
Tank wash water (3)	[1,000 m³]	1	9	5	5	5
Percolate	[1,000 m³]	5	8	4		
Total water directly to the refinery	**[1,000 m³]**	**1,164**	**1,330**	**1,504**	**1,648**	**1,552**
Cooling water for Asnæsværket	[1,000 m³]	224	201	275	457	283
Refinery water consumption	**[1,000 m³]**	**941**	**1,129**	**1,229**	**1,191**	**1,269**

Wastewater		2022	2021	2020	2019	2018
Refinery water consumption	[1,000 m³]	941	1,129	1,229	1,191	1,269
Rain and drainage water	[1,000 m³]	181	136	66	394	318
Wastewater discharged to Kalundborg Fjord	**[1,000 m³]**	**1,122**	**1,265**	**1,295**	**1,585**	**1,587**
Total wastewater to fjord per day	[1,000 m³]	3	3	3.5	4.3	4.3
Nitrogen	[kg/year]	5,299	4,015	4,484	4,515	4,608
Phosphorus	[kg/year]	209	159	235	381	240
COD	[kg/year]	42,518	40,669	45,298	44,377	44,507
pH value		7.1 - 7.9	7.2 - 7.8	7.0 - 8.1	7.6 - 8.4	7.5 - 8.6
Oil	[kg/year]	243	152	102	99	138
Phenol	[kg/year]	3	3	7	9	8
Solid material in water	[kg/year]	3,677	4,012	4,026	4,950	5,804

Emissions to air		2022	2021	2020	2019	2018
Carbon dioxide (CO_2)(12)	[tonnes]	514,010	534,231	516,928	540,361	481,115
Sulphur dioxide (SO_2) (13)	[tonnes]	324	95	206	175	127
Nitrous gases (NO_x)(14)	[tonnes]	517	478	454	449	379

Raw materials		**2022**	**2021**	**2020**	**2019**	**2018**
Crude oil	[1,000 tonnes]	3,832	4,137	3,519	4,047	4,002
Condensate	[1,000 tonnes]	452	471	666	594	466
Mixing components (4)	[1,000 tonnes]	301	218	301	334	789
Additives	[1,000 tonnes]	1.0	1.1	1.1	0.8	0.7
Total raw materials	**[1,000 tonnes]**	**4,586**	**4,827**	**4,487**	**4,976**	**5,258**

Chemicals and other process aids (5)(6)		**2022**	**2021**	**2020**	**2019**	**2018**
Sodium hydroxide	[tonnes]	1,409	1,268	1,246	1,387	1,264
Hydrochloric acid	[tonnes]	764	888	911	830	1,039
Ammonia solution	[tonnes]	53	44	52	45	9
Tetrachloroethene	[tonnes]	42	86	85	108	87
Monoethanolamine/Diglycolamine (7)	[tonnes]	12	6	10	12	4
Conversion booster	[tonnes]	50	32	47	61	15
Other process aids	[tonnes]	239	262	315	271	253
Catalysts/adsorbents	[tonnes]	2,569	14	238	12	318
Liquid ammonia	[tonnes]	1,277	1,336	1,423	1,566	912
Lubricating oils	[tonnes]	30	34	46	44	45
Internal consumption of autodiesel (8)	[tonnes]	38	55	60	53	112
Internal consumption of petrol	[tonnes]	12	11	11	9	12
Total chemicals and other process aids	**[tonnes]**	**3,982**	**4,036**	**4,444**	**4,398**	**4,070**

Products, including intermediate products		**2022**	**2021**	**2020**	**2019**	**2018**
Refinery gas & gas products (9)	[1,000 tonnes]	237	213	206	231	185
Petrol/Naphtha	[1,000 tonnes]	1,344	1,458	1,405	1,528	1,448
Jet fuel/kerosene	[1,000 tonnes]	0	0	0	0	0
Autodiesel & heating gas oil	[1,000 tonnes]	2,140	2,278	2,084	2,323	2,448
Fuel oil (heavy oil)	[1,000 tonnes]	851	863	778	878	1,663
Sulphur (10)	[1,000 tonnes]	3.7	3.3	3.8	4.5	1.8
Products (total)	**[1,000 tonnes]**	**4,575**	**4,815**	**4,476**	**4,964**	**5,246**
Shrinkage & flaring of gas in the flare (11)	[1,000 tonnes]	11	12	11	12	12
Total products, (grand total)	**[1,000 tonnes]**	**4,586**	**4,827**	**4,487**	**4,976**	**5,258**

Waste		**2022**	**2021**	**2020**	**2019**	**2018**
Recycling	[tonnes]	1,075	776	1,329	3,011	507
Combustion	[tonnes]	162	149	216	441	189
Disposal	[tonnes]	54	3	61	86	45
Special waste/ Hazardous waste	[tonnes]	451	773	431	371	546
Total waste	**[tonnes]**	**1,742**	**1,701**	**2,037**	**3,909**	**1,287**
Asbestos	[tonnes]	1	0	1,4	27	0
Asphalt	[tonnes]	157	136	95	377	52
Concrete	[tonnes]	231	211	262	1,288	131
Mixed waste	[tonnes]	71	179	13	19	6
Combustible	[tonnes]	135	132	208	391	189
EDB	[tonnes]	0	3	4	9	4
Contaminated soil (15)	[tonnes]	2,312	3,283	2,097	4,589	1,821
Insulation	[tonnes]	42	44	11	19	11
Non-combustible	[tonnes]	2	3	60	25	31
Iron & metal	[tonnes]	357	130	463	728	174
Cables	[tonnes]	13	6	12	5	1
Catalyst	[tonnes]	0	0	305	0	55
Chemicals	[tonnes]	247	676	239	153	427
Coke	[tonnes]	0	10	9	19	0

Oil	[tonnes]	13	0	7	8	11
Cardboard	[tonnes]	15	14	17	10	12
Paper	[tonnes]	3	2	1	2	0
Plastic	[tonnes]	1	1	2	0	0
Food waste	[tonnes]	5	4			
Salt, sand and granite stone	[tonnes]	164	5	77	0	0
Sanitary articles, porcelain and similar	[tonnes]	0	0	0	0.3	3
Shredder waste	[tonnes]	0	0	0	14	0
Construction waste	[tonnes]	0	0	0	532	0
Spent caustic	[tonnes]	192	97	191	217	126
Hazardous waste	[tonnes]	40	7	0.4	0.5	
Wood	[tonnes]	46	41	61	65	55
Brick/tile	[tonnes]	9				

Safety (16)		**2022**	**2021**	**2020**	**2019**	**2018**
Accidents with lost working hours	Number of	6	3	7	0	8
	Frequency (17)	6.0	3.7	8.1	0	10.3
Injuries	Number of	9	5	10	1	10
	Frequency (17)	9.0	6.2	11.5	1.3	12.9

Notes for Environmental Data

1. No oil is used in the heaters - only fuel gas. However, diesel oil is used to run emergency generators and other equipment and is included here. However, the amount is negligible compared to the amount of fuel gas. Diesel is included here as the quantity is included in the CO_2 accounts. The fuel gas is periodically supplemented with LPG and natural gas, the latter having started in 2018.
2. The energy index is an expression of the overall energy efficiency of the refinery based on capacity, structure, complexity, etc. The index is calculated as actual consumption compared to standard consumption. The lower the energy index, the higher the energy efficiency. From 2018, the energy index has been deducted from planned periods where the production plant was shut down.
3. Estimated value.
4. Including bio-products that are imported and blended to meet legal requirements for biodiesel and biofuel.
5. All figures are based on purchased quantities, except diesel, petrol, and liquid ammonia, which are all measured.
6. Chemicals for the wastewater treatment plant are included in the calculation.
7. Monoethanolamine (MEA) has been reintroduced after TA2016.
8. Including autodiesel used for, e.g., generators used in refueling projects.
9. The amount of refinery gas is included for the overall substance balance.
10. The amount of sulphur contained in the ATS product.
11. Shrinkage is due to evaporation of raw materials and products as well as measurement uncertainty.
12. Calculated according to the monitoring plan approved by the Danish Energy Agency and verified by Det Norske Veritas.
13. Calculated based on gas flow and measurements as well as AMS metering.
14. Calculated on the basis of gas flow, AMS measurement and a key figure established in the environmental permit.
15. Contaminated soil is not included in "Total waste".
16. Safety figures include both own staff and external contractors.
17. Frequency is defined as number per million hours worked.

Glossary

Ammonia solution
Ammonia dissolved in water in different concentrations.

Ammonium Thiosulphate (ATS)
Fertiliser produced from sulphur and ammonia.

AMS meter
Automatic measurement system, a permanently installed measurement system for automatically measuring and recording emissions on a smokestack.

API
Oil separator in the wastewater treatment plant.

ATS facility
Facility producing Ammonium Thiosulphate.

COD
Chemical Oxygen Demand. Measure of the amount of organic matter in wastewater.

Conversion booster
Chemical that increases the conversion to lighter products in the Visbreaker.

CO_2
Carbon dioxide (CO_2) is formed when fossil fuels such as coal, oil and gas are burned. CO_2 is not health hazardous, but is considered the most significant greenhouse gas.

Co-processing
Refining of bio-component, e.g. rapeseed oil, where the bio-component is passed through the processing plant to obtain the same properties as diesel.

CCS
Carbon Capture and Storage is a well-known technology to capture CO_2 from flue gases and store it permanently underground.

CCU
Carbon Capture and Utilisation is a process by which CO_2 is captured and recycled.

Emission
Emissions to air.

Energy index
A measure of the energy efficiency of a refinery, expressed in relation to a standard energy consumption. The lower the energy index, the better the energy efficiency.

Phenol
Aromatic hydrocarbon. Minor spills will not have an environmental impact because they can biodegrade. Repeated major spills to water can affect the aquatic environment.

Flange
Joint between two pieces of pipe.

Flare
The flares are the two flare towers of the refinery where the plant can be depressurised. The flare system is an important part of the refinery's safety system.

Foulet/fouling
Term for when something is coated with coke or similar coating.

Fraction
Term for a particular petroleum product defined by boiling point range.

FRP
See Fuel Reduction Plant.

Fuel Reduction Plant (FRP)
Abbreviation for Fuel Reduction Project – plant which converts fuel into lighter components, especially diesel, by reprocessing the heaviest part of the crude oil.

Guard pond
Holding ponds that ensure that the treated wastewater is clarified and any impurities settle before the wastewater is discharged to Sildebækrenden/Kalundborg Fjord.

HSE
Abbreviation for Health (health/working environment), Safety and Environment.

Catalyst
Process aid that participates in a process without being consumed itself.

KCP (Kalundborg Condensate Project)
Name of the condensate refinery.

Condensate
Term for the light crude oil extracted during natural gas production.

Hydrocarbons
Common name for the chemical compounds that make up petroleum products, the main components of which are carbon and hydrogen.

LOPC (Loss Of Primary Containment)
A performance indicator for accidental release.

LPG
Liquefied Petroleum Gas is a collective term for the hydrocarbons propane and butane. LPG is a natural by-product of refining crude oil.

LVN (Light Virgin Naphtha)
Unsulphurised light naphtha fractor. Used for petrol production.

MEA
See monoethanolamine.

Mechanical work during shutdown
Period of work during which inspections, repairs, modifications, etc. are carried out.

Environmental certification
Approval of a company's environmental management system according to an internationally recognised standard.

Monoethanolamine (MEA)
Chemical substance that absorbs H_2S from gas streams.

MWh
Abbreviation for Mega Watt hour, a unit of energy measurement (1MWh=1,000 kilowatt hours).

Naphtha
Light oil fraction used, among other things, for petrol.

Sodium hydroxide
Strong base, also known as caustic.

NO_X
NOx is formed in combustion processes by the reaction between oxygen and nitrogen in the air. The sum of NO and NO_2 is referred to as NO_X. NO_X contributes to acid rain and algal growth in water bodies.

Total Recordable Injury Frequency (TRIF)
Number of injuries requiring medical treatment and/or absence from work per million hours worked.

The Pier
Refinery port facilities.

Powerformer
Plant converting low octane naphtha to high octane petrol component using a catalyst.

Power-to-X
Turning electricity into something else. Green electricity from wind turbines and solar cells can be converted into green hydrogen (hydrogen) via electrolysis. Electrolysis takes place by applying a current to water (H_2O), thereby splitting the water molecules into hydrogen (H_2) and oxygen (O).

ppm
Abbreviation for the unit of measurement parts per million (parts per million).

PRTR (Pollutant Release and Transfer Register)
Executive order based on an EU Regulation requiring the reporting of various environmental information. The PRTR rules aim to improve public access to environmental information by creating interconnected nationwide registers.

Flue gas condensate
Smoke can contain large amounts of water vapor which, when cooled, condenses into water, called flue gas condensate. When firing with, e.g. wet wood chips, a lot of flue gas condensate is produced, which after cleaning of salts and impurities, can be used for boiler feed water/clean water (demineralised).

Hydrochloric acid
Strong acid.

SIF
Abbreviation for Serious Incident Frequency, serious incident frequency is the number of serious or potentially serious incidents per million working hours.

SO_2
Sulphur dioxide (SO_2) is formed during the combustion of sulphur-containing fuels. SO_2 contributes to acid rain.

Solomon Energy Index
See also energy index. Solomon Associates is a consultancy firm that has developed a tool to compare the energy efficiency of refineries, among other things.

Spent Caustic
Sodium hydroxide containing sulphur compounds.

Hydrogen sulphide
Also called H_2S. Toxic gas which, in the worst case, can cause death by inhalation.

TA
Abbreviation for Turn Around. Major planned shutdown of part or all of the installation for repair and maintenance.

Tetrachloroethene
Name of chlorine-containing chemical compound.

TRIF
Total Recordable Injury Frequency. See injury frequency.

Visbreaker (VB)/Thermocracker (TC)
Equipment capable of converting heavy oil components into light oil components at high pressure and temperature.

VRU (Vapour Recovery Unit)
Recovers light products from the air pushed out of ships' tanks during filling, minimising the emission of hydrocarbons into the air.

VOC
Abbreviation for Volatile Organic Compounds.

Kalundborg Refinery
Melbyvej 10
4400 Kalundborg
+45 59574500

kalundborgrefinery.com