



## Presentation of the DINAMINE Project

The DINAMINE project officially started on January 1st, 2023. The project is receiving funding from the European Union's Horizon Europe research and innovation programme and addresses the call topic HORIZON-CL4-2022-RESILIENCE-01-06 - Sustainable and innovative mine of the future.

DINAMINE aims to radically transform and modernize the mining operation value chain. The project will demonstrate a smart and integrated mine management approach, relying on data analytics tools for real-time monitoring of the performance, risks, mine productivity and recovery rates, and new technologies for machine automation and robotization. DINAMINE will also identify best practices for carbon-neutral logistics and transportation, more energy-efficient processing, and sustainable handling and reuse of mining waste.

To digitalise the value-chain from mine to port, DINAMINE will focus on the following objectives:

- Develop and demonstrate in operating conditions a smart database for near-real-time integration of various types of information such as geological and geophysical data, mineral resources, geomechanics, mineral processing data, tailing and environmental data. The data system will be utilised in combination with the economical and practical factors for holistic mine planning, monitoring, and managing.
- Deploy and test a machine vision-based technology for improving rock engineering-related activities such as rock mass mapping, optimising rock blasting, and suggesting relevant stabilising measures. This will be achieved by incorporating the technology in semi-autonomous mining equipment.
- Demonstrate and quantify the actual sustainability, circularity and GHG emissions benefits of the DINAMINE approach by assessing and addressing the environmental, societal and resource impacts of mining activities.

The DINAMINE project is brought forward by a multidisciplinary consortium of 11 partners from 6 European countries, including 3 research institutes, and 6 industry partners (including 4 SMEs).



The **Norwegian Geotechnical Institute (NGI)** has been a leading international centre for research and consulting within the engineering-related geosciences since 1953. NGI's main office and laboratory is in Oslo, with a branch office in Trondheim and daughter companies in Houston (USA) and Perth (Australia). NGI has a long history of applied research working with stakeholders through Joint Industry Projects and EU research projects. With support

from industry, the Research Council of Norway and the EU's research programs, and in collaboration with others, NGI works to solve the major societal challenges related to the environment and sustainability, infrastructure at sea and on land, as well as the assessment and mitigation of geohazards.



**Skaland Graphite AS** is a small company on the island Senja in Northern Norway. Skaland is the only graphite mine in Scandinavia, the biggest crystalline graphite producer in Europe and accounts for around 2% of the global annual natural graphite production. The operation is presently the world's highest-grade operating graphite mine with mill feed grade average 25%C. The graphite is mined, processed and packed at Skaland and shipped out to

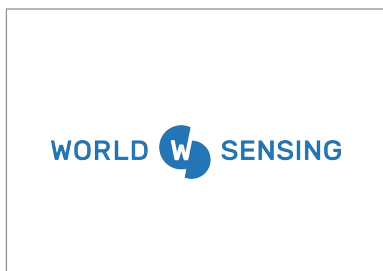
customers by boat. Graphite has been mined at Skaland since 1917 and today employs a total of 40 workers in the mine, plant and administration.



**FELMICA S.A.** (Portugal) is a mining company belonging to the Mota© Ceramic Solutions Group and was founded in 1967. FELMICA is a company with vast experience in the extraction and processing of raw materials for the ceramic industry. FELMICA is dedicated to mining activities and currently holds exploration licences on more than 30 mining concessions of quartz, feldspar and lithium (granitic pegmatites, mineralized in spodumene, petalite,

lepidolite and Li-phosphates) located on the five main pegmatite fields in Portugal. FELMICA produces ceramic feldspar and numerous raw material products for special markets such as abrasives, welding electrodes, container glass, landscaping and gardening, and heavy ceramics. FELMICA also produces high grade silica and mica products. The abundance and diversity of the quartz-feldspar deposits and the versatility of the Mangualde-based transformation plant allows for the preparation of feldspathic

compositions with physicochemical characteristics suitable for the most varied and demanding industrial conditions.



**Worldsensing** (Spain) is a global expert of Internet-of-Things (IoT) monitoring solutions in the mining industry. Its core expertise is in providing sensing and machine-to-machine technologies and services to specific industry verticals, including solutions for Smart Traffic and Heavy-Industry monitoring. Within DINAMINE, Worldsensing will provide the architecture of the Integrated Smart Mine Planning and Managing Platform and the other

digital solutions developed. Worldsensing also oversees the design and installation of sensors in the demonstration sites, ensuring communication between the sensors and the data platforms, and will be responsible for the visualization of the data.



**SINTEF** (Norway) is one of Europe's largest independent research organizations with the vision of technology for a better society. Every year SINTEF carries out several thousand projects for customers large and small. With more than 2,000 employees, SINTEF provides services from ocean space to outer space. In DINAMINE, SINTEF participates within a broad spectrum of activities.

Geologists and mining engineers will work hand in hand to characterize the mine face and the rock mechanical characteristics; environmental science and materials specialists will work on monitoring and mitigation solutions developed for waste and tailings and in life cycle assessments (LCA); data scientists work on mathematical models and algorithms developed to further analyze the knowledge generated throughout all stages of the mining value chain. Additionally, as a research institute SINTEF is to foster the development of valuable scientific and technical knowledge and its transfer to the scientific community. SINTEF is represented by **SINTEF NORD AS, SINTEF AS** and **SINTEF HELGELAND AS**.



**The National Institute of Chemistry** (Slovenia) employs over 300 researchers in 9 departments and two infrastructure centers. The Department of Catalysis and Chemical Reaction Engineering is primarily involved in chemical (process) engineering, reactor and unit operation design and construction, as well as multi-scale process modelling. Research topics include carbon dioxide and natural gas conversion, hydrogen and fuel cell

technologies, biomass valorisation to bio-based compounds, and (bio)pharmaceutical processes.



**Andersen Mekaniske Verksted AS (AMV)** is a privately-owned Norwegian company established in 1860. The company has grown to become a leading manufacturer of specialized machinery, known for its innovation and efficiency, and specializes in designing and manufacturing custom solutions for various industries, including industry, mining, and tunneling. The company is committed to providing innovative solutions to the unique

challenges presented by these industries, helping their clients to increase efficiency, safety, and productivity. AMV's highly skilled team provide the best possible solutions to their clients while adhering to the company's values of quality, safety, and sustainability.



The **PNO Group** (aka PNO Consultants), established in 1984, is a European group, made up of a pool of more than 400 professionals across 9 Member States. Every year, PNO supports more than 3.000 clients in their R&D processes, realizing original data-driven and expert-driven analysis and creating over 300 cutting-edge R&D projects – changing the world for the better. PNO has drafted and successfully executed dissemination and exploitation

plans for a great number of European projects in various sectors. In this project, PNO is represented by CIAOTECH S.r.l., the Italian branch of PNO Consultants, specializing in R&D Advisory, Innovation Management and funding procurement, providing consultancy services to private and public organizations.

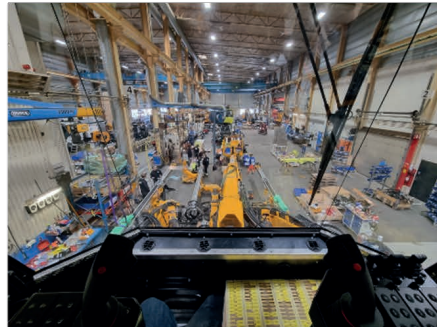


**SPECTRAL Industries** (Netherlands) is a high-tech company that manufactures optical sensors based on the LIBS (Laser Induced Breakdown Spectroscopy) technology for robust and real time chemical sensing. SPECTRAL offers tailor-made solutions for demanding industrial applications ranging from mining to recycling to material processing. A big part of SPECTRAL's work is dedicated to the mining sector where the combination of robustness,

high speed and accuracy is of paramount importance. SPECTRAL's LIBS-based sensors offer such features for an inline and real-time multi-element characterization of the materials without using any sample preparation. The possibility of performing in-situ chemical analysis without any sample preparation makes these sensors a perfect candidate for a more sustainable mining process and therefore a useful tool for their incorporation among the chain of sensors detailed for DINAMINE. To this end, SPECTRAL will manufacture and install a dedicated sensor at the feldspar mining operation (FEL, Portugal) to develop quantitative models for an early elemental characterization of the crushed rocks. This will also provide information to evaluate the benefits of in-pit crushing in terms of environmental and economic aspects.

## Updates from the consortium!

In April, the project coordinator (NGI) made a visit to AMV headquarters in Flekkefjord (Norway) and had the opportunity to tour the workshop where the Jumbo Drill is being assembled and deployed as part of the project, as well as their other types of heavy machinery and vehicle equipment.



In May 2023, the DINAMINE project took a remarkable journey to Portugal, where we explored the mine and processing plant operated by our partner Felmica, which will provide one of two operational mine sites to showcase the power of innovation and sustainability in action. The consortium had the opportunity to witness firsthand how digitalized mining can revolutionize the European mining industry and pave the way for increased sustainability.



In May 2023, the DINAMINE project also visited the Skaland Graphite mine and processing plant in Senja, Norway. The high-quality graphite extracted by Skaland plays a crucial role in various industries, from electronics to energy storage, underscoring the importance of mining for a sustainable future.



Stay tuned for more updates as we embark on our mission to create a mining industry that is greener and more sustainable!

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