



Technological Solution Overview
ENNOX Business Opportunities in Kazakhstan

ENNOX TECHNOLOGY NORWAY

This document contains brief technical information on the Ennox Green Extraction (EGX) system used for the reclamation and recultivation of oil-contaminated lands and soils and the prospects for introducing this technology in the Kazakhstan market

Maryana Lunia

Business Development Manager



ABOUT US

Ennox Technology AS – a Norwegian company that has developed advanced technology in the field of oil sludge treatment. Our activities are directed at treatments (cleaning) of oil-contaminated soils/solids and reclamation of oil polluted territories.

Ennox has been operating on the market since 2010. The company's office is in Stavanger, the Kingdom of Norway.

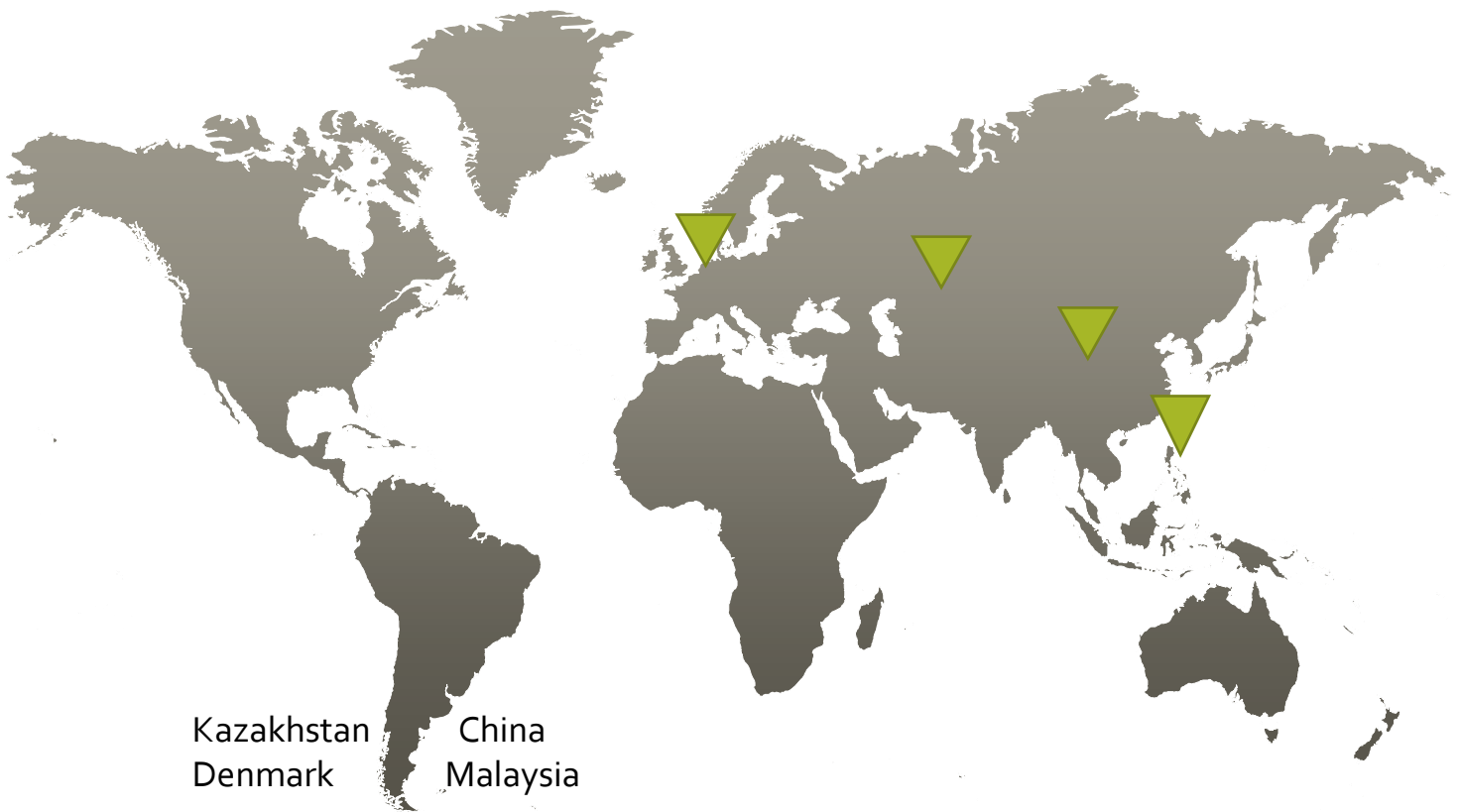


Ennox's portfolio consists of engineering consulting, design, manufacturing, and sustainable high-tech technologies for oil/water solids separation, sludge management, oil spills, and soil remediation.

OUR GOAL

Safely clean up oil-contaminated soils, water and reuse recycled resources for the benefit of the population, nature and environment.

OUR ECO SYSTEM OF RELIABLE PARTNERS

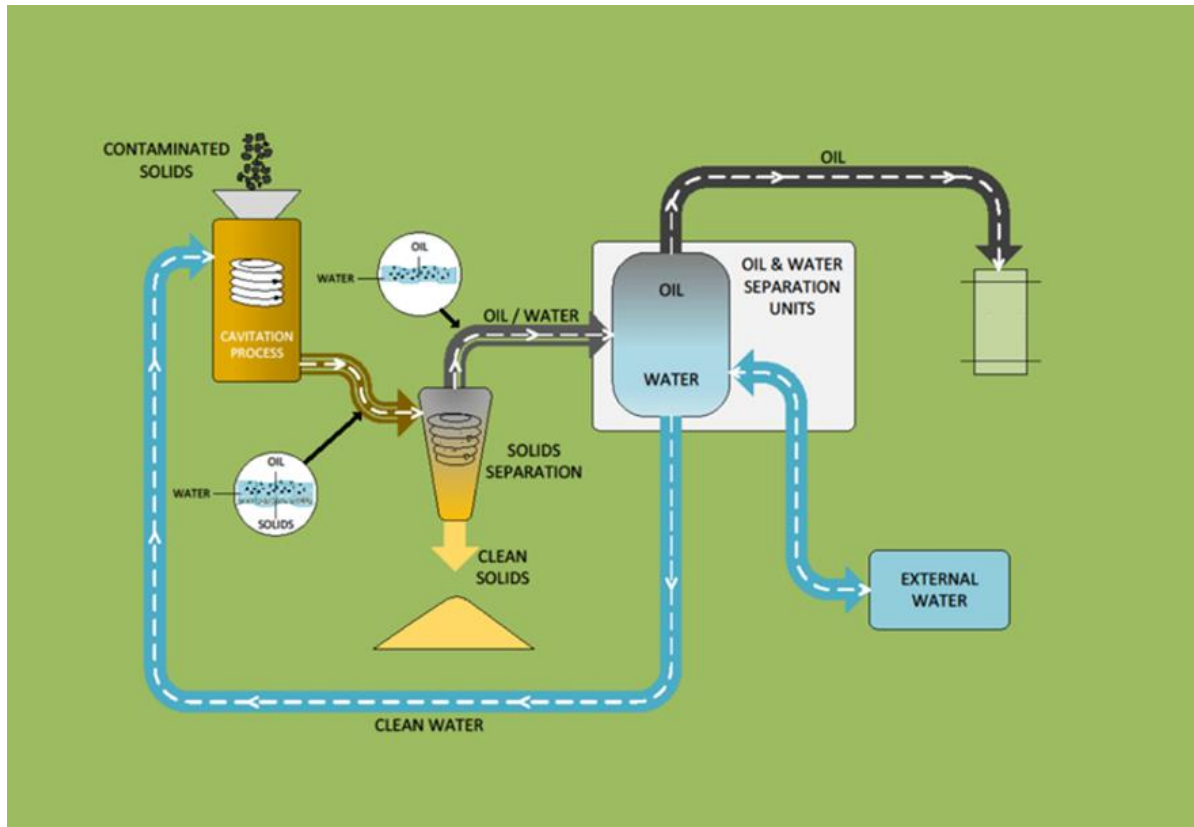


With the support of our partners, Ennox was able to enter new markets, understand the specifics of the oil sludge management industry in these countries and find suppliers of additional equipment for EGX (shakers, hydrocyclones, etc.). In the near future, in addition to Kazakhstan, our company plans to focus on China (the market for oily waste is about 3 million tons per year). Ennox is already in the process of testing macerators with a potential buyer in Xian.

TECHNOLOGY

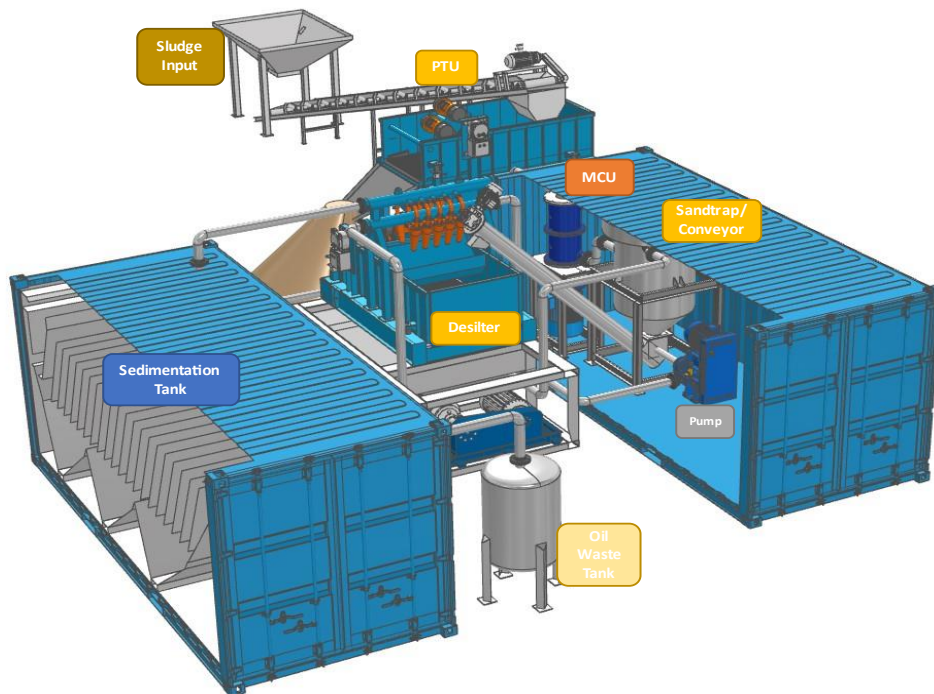
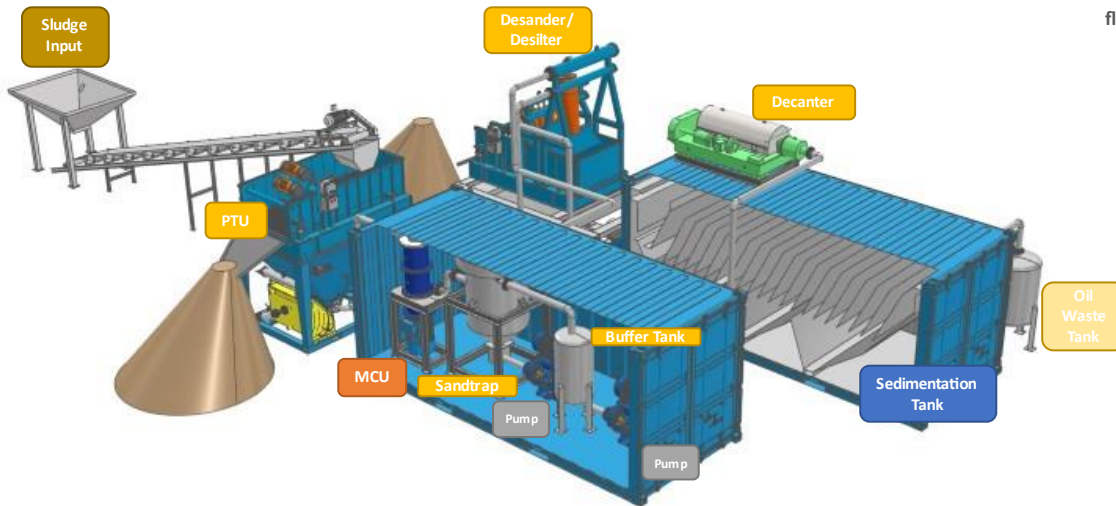
Ennox Green Extraction (EGX) system is the result of vast research by Norwegian and German engineers. The technology recycles sludge in an efficient and cost-effective manner with minimal environmental impact.

HOW OUR SYSTEM WORKS



The EGX unit consists of a main unit and several auxiliary units connected to form one system. The main core of the technology is macerators, where hydrodynamic cavitation occurs, the process of formation of cavities filled with gas, steam (the so-called cavitation bubbles or caverns) in a dropping liquid. Cavitation bubbles are formed in those places where the fluid pressure reaches a certain critical value. If a decrease in pressure occurs as a result of high local velocities in the flow of a moving droplet liquid, then cavitation is called hydrodynamic. The phenomenon of cavitation is local in nature and occurs only where there are conditions created for the process. It is cavitation that separates the oil fraction from mechanical impurities.

The illustrations below show two models of the EGX mobile system.



The presented mobile units are universal due to the fact that the specification of technologies allows processing various types of oil contaminated soils, without being tied to the percentage of oil content and the size of solid particles.



PERSPECTIVE ENNOX TECHNOLOGY AS IN KAZAKHSTAN

“According to official studies, the “reserves” of oil sludge in Kazakhstan exceed 40 million tons, in Russia 100 million tons, in Azerbaijan – 20 million tons, in Ukraine – 5 million tons” (Source Neftegaz.ru).

Additional 400 thousand tons of oil waste are generated during the oil processing and transportation on the territory of Kazakhstan, as a result of natural spills and accidents.

Now, the world market, including Kazakhstan, does not have a unified method for processing oil sludge. By proving the performance of the EGX system in Zhetibai, KZ, Ennox has the opportunity to be recognized as the preferred method of hydromechanical cavitation in the waste management industry.

The topic of waste disposal is rather acute in the Environmental Code of the Republic of Kazakhstan dated January 9, 2007. The direction of "green" growth and low-carbon economy as a tool for sustainable development is laid down in the Strategy-2020, PIIR, and international initiatives.

Additionally, there is an active financing of projects for the disposal of oil sludge by oil companies. For example, Mangistaumunaigas annually allocates significant funds for the processing of historically accumulated oil waste, both at landfills and in Situ. The amount of funds allocated by the company as part of the disposal / processing of accumulated and newly formed pollution increased from 881 million tenge in 2016 to 7.283 billion tenge in 2021 (Source World News).

These factors positively influence business development opportunities for Ennox.

A review of the oil waste disposal market showed that the cleaning methods used by local companies are outdated and do not meet the requirements of the modern world. In Kazakhstan, methods of disposal by incineration and burial are still used. The biological cleaning method also has a number of disadvantages, such as low productivity and high cost, the impossibility of implementation at low temperatures.

As for an international market, we see that modern innovative technologies have appeared in Germany and the Netherlands. A marketing study found that there



were approximately ten active waste treatment companies in Germany in 2021, many of them focusing on water treatment and biotechnology. Companies in this industry are "young" and their technological solutions, like Ennox's, improve technological solutions by testing systems "life" on projects.

Ennox's direct competitor in the Norwegian market is Soiltech, a provider of eco-technology services for the treatment, purification and polluted water, solids from industrial waste. Soiltech's specialty differs from Ennox's in that their systems clean up contaminated mud fluids with soil content, not soil from contaminants.

Competitors in Germany.

ARE Deutzen GmbH. Thermal treatment. After mechanical pre-treatment and, if necessary, packaging, soil, construction debris and other types of waste are subjected to heat treatment in a rotary ovens at a temperature of 250-560 °C. Thermal desorption takes place in a rotary kiln with a lack of oxygen. At a processing temperature of 250-560 °C and a residence time of approx. 20 min pollutants are destroyed or pass into the gas phase.

Cronimet Envirotec GmbH. Technological leader in the field of vacuum heat treatment of drilling, metal and industrial sludge, as well as metal dust and powders.

Eneotech Umwelt GmbH offers a full range of soil and groundwater restoration services. Methods: bioremediation, thermal desorption, in-situ, stabilization/hardening. Young company that has been on the market for 10 years. There is no information about projects.

Netherlands.

G.I Dynamic offers a unique in-situ soil restoration technology called PuriSoil®, allowing to clear large, polluted territories for one approach.

Pipes are buried in the ground to a depth below the contaminated soil layer. Air is pumped into the soil through pipes. A uniquely developed bioactive material (PuriSoil starter) is mixed into the top layer of soil. Air carries pollutants to the surface rising up through the soil. In this bioactive zone, pollutants are efficiently broken down and converted into CO₂ and water.



Hmvt Environmental Solutions. Soil cleaned using a number of methods: extractive, biological, chemical and thermal.

Comparative analysis of business concepts and technical solutions shows that Ennox has several advantages:

1. Ennox provides a complete engineering solution to the problem of cleaning contaminants from A to Z, while many companies, such as Flottweg, provide only centrifuges, which in most cases must be completed with other equipment.
2. EGX technology does not require heat. For example, incineration requires high temperature $t = 800-1200^{\circ}\text{C}$. EGX unit uses hot water of 80°C maximum.
3. The technology does not require a large number of additives and chemicals. Additives are allowed in the EGX system, but the amounts are low compared to those used by our competitors.
4. Guarantee of soil cleaning up to 1% and below. Biotechnology might be used as additional solution to the problem, however it is not the main cleaning method. It means that mechanical treatment has low OPEX.
5. The Norwegian government is actively supporting innovative green segment, which enables Ennox clients to contact Eksfin Norway, an organization that offers loans and export credit guarantees. Kazakhstan is a favourable country for providing financial assistance from Norway.
6. Administrative and engineering experience in Kazakhstan, knowledge of local norms and regulation about required documentation.

In Kazakhstan, since 2015, active steps have been taken towards the national transition to a green economy, such as:

- Creation of a waste management system
- Development of sustainable and highly productive agriculture
- Sustainable use of water resources
- Development of renewable and alternative energy sources
- Reducing the negative impact on the environment
- Energy saving and energy efficiency improvement



- Careful and efficient management of ecosystems.

This information provides a strong basis for the conclusion that environmentally friendly technologies such as Ennox have a high chance of being deployed, developed and to achieve success on the territory of the Republic of Kazakhstan.

Ennox Technology AS
Kanalvegen 8, 4033
Stavanger, June 2022