INNSEP –

NORWEGIAN TECH AWARDS 2015

It started with a drill and a steel scrub. Now the founders purify exhaust and gas technology

Candidate 6 to Norwegian Tech Award in 2015.

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In the EagleBurgmann workshop at Skedsmokorset a sponge-like disc of metal foam rotates inside a plexi-glass cylinder.
Technical manager Jon Baklien fills water and compressed air in the container, but the only thing that passes the sponge-like disc is dry air.

The machine is the prototype of a separator which can save oil companies several billion, according to company founder Innsep behind technology.

EagleBurgmann is Innseps first commercial partner and wants to use separation technology to improve the function on gas compressors on the Norwegian shelf. Eventually they foresee that the technology can also be used to clean soot from diesel exhaust on ships, but more on that later (see video).

The core of the technology from Innsep that EagleBurgmann uses is a rotating, sponge-like disc. Photo: Eirik Helland Urke

Steel Scrub on drill

It all began in 2008. NTNU professors Maria Fernandino and Carlos Dorao dealt with challenges the separation of liquid and gas.
The couple explored how centrifugal force instead of gravity, could be used to draw liquid out of the separator.
One of the steps for testing of the concept was to attach a steel scrub on a drill, also pouring liquid.
- When the drill rotated, we proved that we could collect water in the fibers and sling it sideways, without any water coming through underneath. This was the starting point for applying for support to develop the concept further, telling Innsep MD Sondre Jacobsen.

Started company

In 2011 the couple founded the company Innsep together with Jacobsen to develop and sell separation technology to the oil industry.

The company is owned by the three and NTNU Technology Transfer.

Now Innsep is one of six actors nominated for Norwegian Tech Awards 2015.
Technical Ukeblad technology prize is awarded to a player who has found a good engineering solution or breakthrough on a technological or societal problem (see fact box).
Read about those who have won the award before here.

Critical parts of the North Sea

Back in the workshop at Skedsmokorset. Here some of the most critical parts of the pumps and compressors used for export of oil & gas on the shelf are serviced. Often, employees must mobilize at short notice to service jobs on the platforms.
The parts in question are the Dry Gas Seals. These are devices that sit between the shaft and the compressor housing and ensures that no gas leaks from the compressors.
On the inside pressure is typically around 200 bar and shaft rotates between 10,000 and 15,000 rpm.
The Dry Gas Seals operates with 1-2 micron clearance. Because they are of non-contact type, they use natural gas and nitrogen under pressure as barrier- gas to keep them tight.
This is where the separator to NTNU couple comes into the picture. The gas used in the seal must be as clean and free of carry-over of liquid as possible.
Today filters are used for this, but EagleBurgmann will now use the separator from Innsep in addition to conventional filters for increasing the reliability of the seals.

The prototype is at the workshop of EagleBurgmann.
To purify gas used to protect compressor seals only the plexi-glass part need to be replaced with a steel pressurevessel.
Photo: Eirik Helland Urke

Improved reliability

The seals may be seen as a sort of Achilles heel in a compressor.

- If something goes wrong with one of the seals in a compressor, then it must be shut down until they are repaired or replaced. It's that simple, says Jon Baklien.

The seals are designed so that they only need service every five years, but if sticky liquid comes in, they can hang up and fail. This can occur, for example due to changes in well stream.

- In our service department, we see recurring problems from impure gas being used as barrier gas. This interferes with the operation and leads to shorter periods before they must be overhauled, says Baklien.

Baklien estimates that one additional overhaul of a compressor costs somewhere between one and three million NOK. In addition, production loss oil companies can get by taking the compressor out of operation.

He says that there has been considerable interest in the separator from oil companies.

- One company has put down fast-working committee to look at solutions to increase the reliability of the compressors. They have been presented this and think it looks interesting, he says.

- Originally Innsep was customers with us, because they were using our magnetic coupling. We saw their technology, and thought wow, this we can also use. So it was a win-win situation, says Baklien and shows how they build the separator into the equipment that they have had on the market for several years.

- **Innsep MD Sondre Jacobsen believes the method can be used in almost all fields where liquids are separated from the gas.**

- Our technology is going to succeed as the separation of liquid from gas is a surprisingly important process in almost all industries and technologies. Separation has essentially remained unchanged over the last hundred years, so when we come to a solution that can reduce weight, volume and simultaneously increase efficiency, this will solve many challenges in various industries, he said in an email.

He estimates that the technology can be used offshore already at year end.

- The interest is high, and we see that the oil industry is anxiously waiting for the technology to get the most uptime so that we have proven sufficiently robustness and reliability, writes Jacobsen.

Alongside EagleBurgmann, Innsep also cooperate with Statoil for a project to separate liquid from the main gas stream before it enters the compressor.

Jon Baklien injects exhaust mixed water in the separator. It is pure air.

Photo: Eirik Helland Urke

Emissions

Also at EagleBurgmann they have their eyes open for that the technology from Innsep can be used for more than better reliability of seals.
As extra experiment Baklien has dissolved a piece of real diesel exhaust into water. Now he stands and spurts the gray-black mixture together with compressed air into the Innsep separator. It is the first time the separator is used for this.
The sponge-like rotor turns dark, but not throughout. Gray-black liquid runs down the edges of the separator, while seemingly clean air comes out.
- The market potential for emission control is huge with the new rules coming, says Baklien and says that they are now in the process of examining the possibilities of using the technology from Innsep to clean exhaust from diesel engines.
Innsep chief Sondre Jacobsen characterize the demonstration as a small world sensation.
- This confirms that technology can be used to purify exhaust, he says.