

CASE STORY · CROMAX 280X IH AND OVAKO 520M STEEL · HYDRATECH INDUSTRIES

# PITCH-PERFECT PERFORMANCE

**Hydraulic cylinders are one of the most critical components in a pitch control system – the mechanism in a hydraulic wind turbine that enables rotor blades to adjust to constant shifts in the wind. One Danish hydraulics cylinder manufacturer is constantly pushing the limits of these components to ensure many years of pitch-perfect performance.**

On the flat plains of Jutland, Denmark, where the pale towers and blades of wind turbines are visible on the distant horizon, Hydratech Industries is working all-out – three shifts a day plus weekends – to produce hydraulic cylinders that are in hot demand by the world’s leading manufacturers of next-generation hydraulic wind turbines.

These cylinders, which are manufactured primarily using Cromax® and M-Steel® bars, both from Ovako, serve as Hydratech’s wind turbine hydraulic cylinders. The cylinders drive the “pitch” of the rotor blades – the angle of the rotor blade to the wind. The optimal pitch is the one that generates the maximum amount of energy. In extremely high winds cylinders they also play a critical role in helping the rotor blades “pitch out” of the wind to prevent damage.

“If the cylinders are not working for whatever reason, you won’t be able to pitch out of the wind and you could destroy the turbine,” Steen Helberg, Marketing Manager, Hydratech, points out.

Dynamic loads on wind turbine cylinders are enormous. When the wind is blowing, the pistons are averaging 10 million strokes a year. They are designed to function flawlessly during Arctic winters as well as hot summers. And they must not only be able to handle constantly changing loads, but also dirt, salt and extreme temperature fluctuations.

Moreover, Hydratech’s cylinders are expected to last 25 years. Consequently, Cromax bars, which form the cylinders’ piston rods, are considered vital – a “strategic material” as described by Torben Olesen, Purchasing Manager. As such, Hydratech scrutinizes every step in the production process to identify problems and improve quality, from the production of the Cromax bar and cutting to delivery, machining, assembly, painting and testing.

For example, any flaws on the surface of the bar – tiny scratches, pressure indents, imperfections of any kind – are often not visible to the naked eye but can destroy the cylinder’s seal and trigger costly repairs. One of the many potential sources of these flaws is the chroming process itself, and over the years Hydratech has worked closely with Ovako to dramatically reduce these imperfections.

Ovako has proposed reducing Cromax bar dimensions by almost 5 percent – from 90 to 85 mm – while maintaining the same “forces” as those of existing bars. Consequently, smaller pistons would enable a reduction in the size of the hydraulic cylinders, facilitating installation and serviceability.

“We see many opportunities in using more high strength materials,” Olesen says.



Steen Helberg, Global Marketing Manager, Hydratech Industries

Once the cylinder is designed, Hydratech puts the hydraulic cylinder through a battery of extensive tests. Among these are high load tests, long and short stroke tests, as well as tests that analyze performance in extremely high and low temperatures, according to Mads B. Christensen, Technical Manager.

“Our tests are running continuously not only on new products but on existing products as verification tests,” explains Christensen. “Some tests run for nine months, some for a couple of days. For example, we perform wear tests to see how long the cylinder can work without wearing down the seal.”

If the seal leaks the cylinder could potentially damage other critical components in the turbine. “The Cromax bar cannot be too smooth or too rough,” explains Christensen. “If it’s too rough, it’ll wear out the seals too quickly. If it’s too smooth, it can’t be oiled properly – and the lack of oil creates friction. It needs to be high quality, but also not too costly.”

At the same time, costs and quality pressures are also being placed on M-Steel from Ovako, which is used for the cylinder top. Two years ago M-Steel was selected by Hydratech to replace a similar material supplied by a competing steel manufacturer. According to Mark Høyer Jensen, Production Technician, the consistent quality of M-Steel enabled Hydratech to increase capacity and cut costs in the machining process.

“The advantage of M-Steel is that we always get the same quality on every delivery,” explains Jensen. “That means better machinability. And better machinability means less cost in tools and fewer stops. Since we can use the same parameters for every delivery, I can push the machines faster and faster!” says Jensen.

“Another critical advantage is closeness of the material,” he adds, referring to Tibnor, the Nordic’s leading distributor of steel products. Tibnor has an agreement with Hydratech to stock all of their M-Steel and about 20 percent of Cromax requirements in case of sudden unexpected demands.

“We work tightly with Hydratech on forecast and actual demands and with buffer stocks in Taulov,” only a few hours drive from the Hydratech assembly plant, explains Carsten Holmgaard, Tibnor’s sales manager. “There’s a lot of trust and confidence in this business.”



### Cromax 280X IH

Cromax 280X IH is a surface-hardened version of standard 280X. It is based on a low carbon, micro-alloyed steel combining high strength with excellent weldability and machinability. The mechanical characteristics of Cromax 280X are up to 20% higher compared to corresponding standard grades. This improvement is achieved without detriment to manufacturing properties. Cromax 280X IH can be supplied in different surface executions such as standard, Cromax C and Nickel-chrome

Key benefits:

- Improved resistance to external impact during rod manufacturing and field usage
- Better ductility and toughness in both the base steel and hardened layer compared to conventional medium-carbon steels for surface-hardening
- Possible cost and weight reduction through downsizing of piston rod designs without loss of load-bearing capacity
- Significantly higher mechanical characteristics
- Excellent weldability and machinability

### M-Steel

The consistent quality of M-Steel lowers manufacturing and cutting costs by enabling higher cutting speeds (up to more than 30 % over conventional steels) and reducing tool wear and workflow interruptions.

Key benefits:

- Automation and faster machining
- M-Steel treatment can be applied to most steel grades
- Complies with standards yet adds superior machining properties
- Unmatched quality consistency

### Ovako facts and figures

- A leading producer of engineering steel for customers in the bearing, transportation and engineering industries
- Products: low-alloy steels and carbon steels in the form of bars, tubes, rings and pre-components
- Locations: Ovako has ten production plants and a number of sales companies in Europe, Asia and the USA
- Net sales 2015: 834 MEUR
- Employees: 2,905

### Hydratech Industries facts and figures

- HQ in Vraa, DK
- Designs and manufactures hydraulics and cooling solutions for wind turbine industry and hydraulic cylinders for offshore, marine and industrial applications
- Number of employees: 500
- Turnover (2015): 94 MEUR
- Other locations:
  - Wind Power, Silkeborg (DK)
  - Suzhou, China
  - Robertsdale, Alabama
  - Bengaluru, India

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