## Quality steel for advanced gear racks - Toolox at Sanders

With the never ending need to decrease costs, companies are focusing their attention much more these days on using raw materials with guaranteed properties. This is also the case for advanced steel applications, for example; welded plate structures or wear resistant applications, where for many years only steels with full traceability are used. For some reason this is not always the case for large sized machine component applications. For such applications, it is still common to choose steels based only on standards, meaning that the origin (and therefore the quality) is not fully known. Quite often the components are also heat treated to give the required mechanical properties, further decreasing the possibility to control the quality and performance of the component. This situation is even more surprising since many of the applications are ones where safety is crucial, and thus the reliability of the component absolutely necessary. Quite frequently, end customers have to make specific tests on the finished components just to test the steel quality, a procedure that is expensive and of course takes valuable time. A reason for this unfortunate situation is probably that the quality steels available (mainly tool steels) have been quite expensive, and also due to their high carbon content quite costly to machine. For the last couple of years a new alternative has been available in the market, the Toolox steel plates from the Swedish steel maker SSAB. Toolox is delivered in the fully heat treated condition, with ultrasonic and mechanical testing carried out on every plate, making it possible for the end customer to know exactly the properties of the steel he is using for his component. Not only taking away the need for extra testing, but also making it possible to design with smaller safety margins. The low carbon content of Toolox and its stability during machining also makes it very cost effective in component manufacture.

The Dutch company SANDERS, have been specialists in custom made gears and drive components since 1846, and now they have discovered the exceptional benefits of Toolox and have used this steel in two advanced projects.

In the first project, Fig 1, a 4 metres long gear rack with modul 30 needed to be made for an offshore project. The end customer had very strict demands on the mechanical properties of the component. Besides a hardness of minimum 300 HB, the steel needed to have high toughness levels at -20 ºC. These demands were fulfilled by standard Toolox. The alternative, 42CrMo4-V, did not meet the specification without a subsequent heat treatment.
Machining of the component in Toolox also went well, with strict geometrical tolerances obtained without any problems.
In the second project, Figs 2 and 3, an even higher hardness of 400 HB was specified. A curved gear rack 4 metres long, with a 3.7 metre radius was made for the specially designed Red Bridge, a well known draw bridge in Utrecht, Netherlands. The alternative to Toolox in this case, 34CrMo4, was almost impossible to use due to the curved shape of the gear rack. It would have been very difficult to obtain the necessary shape after machining and hardening of 34CrMo4.
Toolox was the preferred material and Olivier Stapper, the plant manager comments;

"We are specialized in the production of all kinds of gears and gear racks. Form stability is very important, regular steel qualities are likely to cause problems during machining and after hardening. The risk of rejection is a major concern, because of the good dimensional stability and the right hardness we used Toolox 44. We were very impressed with the flatness and the form stability, and we had no problems with the machining of Toolox 442

**Fotos:** SSAB / Oxelösund / Sweden

**Fig.: 1** *Gear-rack for an offshore application manufactured by SANDERS, the Netherlands*


.**Fig.: 2** *Curved gear rack for the Redbridge draw bridge manufactured by SANDERS, the Netherlands*


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**Fig 3** *Close up of Curved gear rack for the Redbridge draw bridge manufactured by SANDERS, the Netherlands*