

## **Machining at the limit of development - long hole drilling in Toolox**

For several years now there has been a trend amongst mould and die makers to try and avoid heat treatments on their products if possible. There are several benefits in doing that; the obvious lower costs and shorter delivery times, but also a controlled consistency of the properties as the risk involved with heat treatment can be avoided. This trend has become even more critical due to the present situation of difficult economical conditions. Mould and die makers need to be even more competitive with their costs, but it is also crucial to be able to deliver the products in as short time as possible, especially with the end customers placing the orders as late as possible. At the same time, long production runs are not as common as before, making it even less important to heat treat the moulds and dies to the highest hardness possible. To meet this increasing interest in avoiding heat treatments, steel makers are manufacturing more wear resistant and harder mould and die steels. At present, the prehardened steel with the highest toughness and hardness in the market is the tool steel from the Swedish steel maker SSAB, called Toolox.

Toolox 44 has a high hardness of 45 HRC, it has excellent machinability thanks to its low carbon content and high homogeneity. But sometimes the customer can have machining difficulties the first time they use the steel.

The most critical operation has been found to be long hole drilling (so called gun drilling). Long hole drilling is typically carried out in mould and die making when cooling channels are required in the tool.

To develop procedures and recommendations to successfully carry out this process in Toolox, SSAB have found it beneficial to cooperate with a renowned specialist in this field. Therefore a technical development project together with the tool supplier Botek, and the French long hole drilling specialist René Devaux has been carried out.

Optimising the drilling parameters and the tooling, René Devaux did not find the long hole drilling operation too difficult to make. In one test, five 12 mm diameter holes


were drilled to a depth of 650 mm, giving a combined total depth of 3250 mm without any complications, no re sharpening of the drill was needed.

Based on the tests carried out, Botek gives the following comments on long hole drilling in 45 HRC Toolox steels;

- Long hole drilling in Toolox 44 is totally possible, but parameters need to be individually adapted for each application
  - No vibrations can be accepted
  - Coated tools with the correct carbide type are extremely important
  - It is crucial to have the recommended angle on the drill tip (not too sharp)
  - 100 % drilling oil is needed (no mixture can be accepted)
  - For holes longer than 40 x diameter, support of the drill is needed


The development of special steels along with new parameters in tooling are the way forward, but the important technical know-how of how to capitalize on these innovative developments, and to take advantage of the major benefits they offer are crucial to the success of the relevant industries.

The successful cooperation and commitment of SSAB-Botek-René Devaux is a good example of how a total solution can be achieved and offered to the end customers.

**Fig.: 1**  SSAB\_Toolox\_06\_1\_09\_Longholedrilling\_Fig.1.jpg



Toolox 44 has for its high hardness, 45 HRC, an excellent machinability thanks to its low carbon content and high homogeneity.

**Fig.: 2**  SSAB\_Toolox\_06\_1\_09\_Longholedrilling\_Fig.2.jpg



Development of steels needs to be followed by development of tooling but the necessary know-how is also needed to be developed. The cooperation of SSAB-Botek-René Devaux is a good example of how a total solution can be offered to the end customers.