Deep Drilling – A Special Kind of Task

TBT Tiefbohrtechnik – The expert in the manufacturing of Deep Hole Drilling machines for centrifugally cast pipes in the oil and gas industry.

Counter boring of long centrifugal cast iron pipes is a task that occurs regularly at the Deep Hole Drilling Experts of TBT Tiefbohrtechnik in Dettingen/Erms. Centrifugally cast pipes are used particularly in the petrochemical industry. As a global player and turn-key expert, TBT supplies the deep hole drilling machines and the necessary know-how.

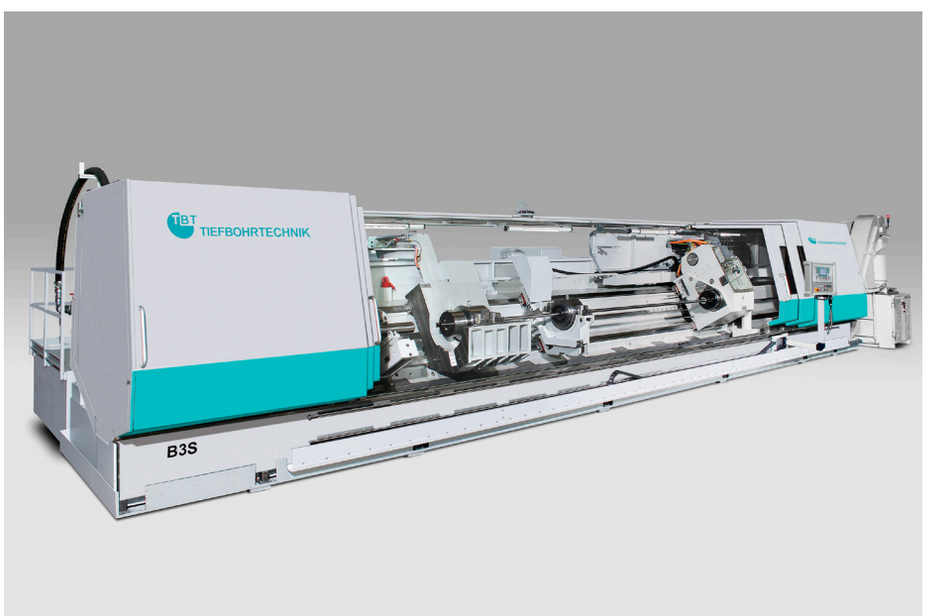
Deep hole drilling is not always about drilling "into solid". The task can also be to improve the quality of existing raw bores, for example centrifugally cast pipes. The bore is irregular in diameter, its surface is heavily scaled and in this condition, it is unusable for many purposes, for example if the pipes are to serve as a pipe system for liquid media. Such applications can be found, among other things, in the petrochemical industry.

The stress on the pipes is enormous due to the high temperatures. The only pipe material that can be used is rust- and temperature-resistant steel with a high proportion of chromium and nickel. Furthermore, petroleum experts prescribe pipes with an exact and constant concentricity of diameters. If the pipe wall thickness fluctuates, this would otherwise lead to an uneven distribution of high stresses with the risk of breakage. This requirement leads to centrifugally cast pipes. However, since the crude oil flows through at high pressure, the fluidically unfavourable surface would cause high pressure losses and the accumulation of deposits.

An expert who is up to these tasks and challenges can be found in Dettingen/Erms, Swabia.

TBT Tiefbohrtechnik GmbH & Co

TBT Tiefbohrtechnik develops large deep hole drilling machines and has the know-how for exotic applications as well. Centrifugal casting machining is not a new territory for TBT Tiefbohrtechnik.

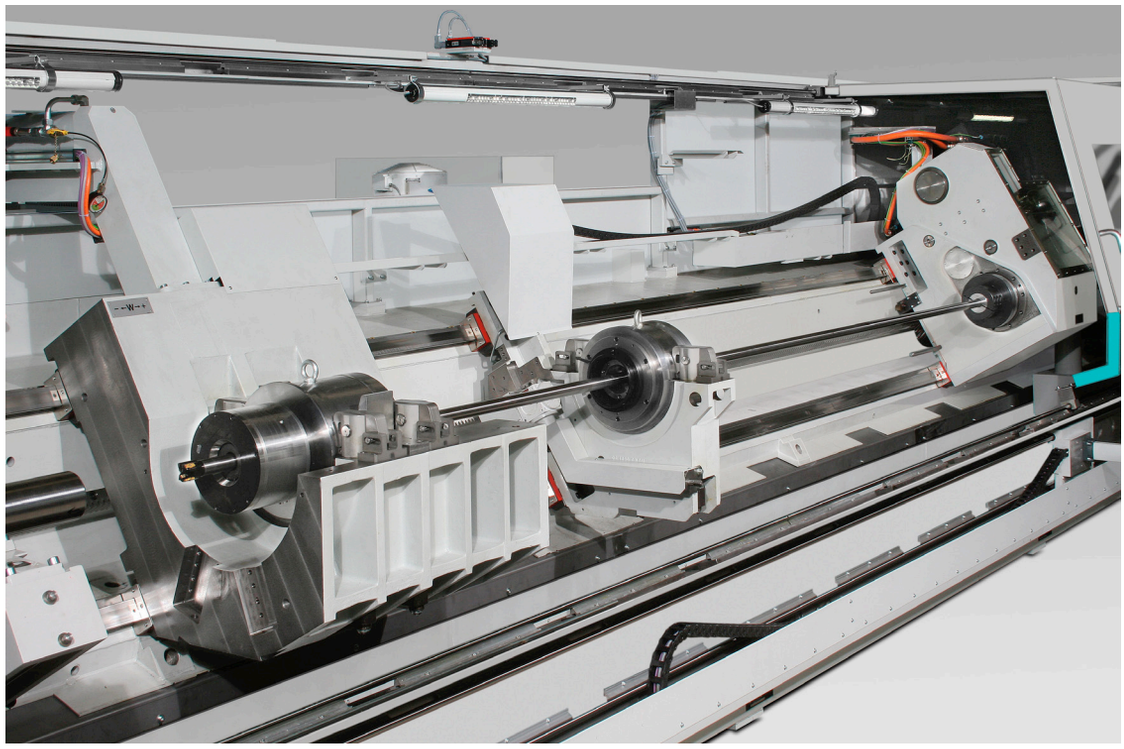


Tool principle with constructive tricks

When processing deep hole drilling of centrifugal cast iron pipes, only tools based on BTA/STS technology (STS = Single Tube Technology) are used. The coolant is supplied through the annular channel between the tool and the bore wall. When drilling solidly, the drill head equipped with carbide indexable inserts has a chip mouth through which the coolant flushes the chips out of the machining zone and into the drill pipe. From there they finally reach the chip conveyor.

Normally the tool works "headfirst" through the workpiece. Guide strips behind the cutting edges keep it on course so that a straight hole is created. When processing centrifugally cast pipes, however, some rethinking needs to be done. Because the tool is not supposed to create a straight hole. The basic idea of this statement

quickly becomes clear. Pipes are never 100% straight, not even centrifugally cast pipes. In special applications there is a curvature of approximately 1 mm per 1 m of pipe length. To meet the requirement of uniform wall thickness over the entire pipe length, the tool must follow this curvature. In these applications, the principle of drill head guidance is reversed. This then leads to a pulling deep hole drilling process.



Since surfaces that are as smooth as possible are desired, a pre-drilling head is required for rough machining and a skiving drilling head for finish machining. A guide system with hard metal strips is used, which are hydraulically supported in the raw hole and compensate for irregularities in the surface. The drill pipe therefore contains hydraulic hoses. This is not a problem for chip removal, because during pulling machining this takes place in the opposite direction through the machined pipe anyway; The usual chipping mouth is missing from this design.

The process flow with these special tools looks like this: First, the machine operators clamp the workpiece onto the deep hole drilling machine. The drill pipe is then driven completely through the raw hole in the workpiece and the drill head is mounted. Then the drilling is carried out by pulling until the drill pipe is back in its original position. The subsequent skiving is carried out by pushing in the opposite direction and with the cutting edges first. The depth of cut is only very small in this processing step. At the end of this operation, the drill pipe and the skiving drill head are pulled out of the workpiece again. The cutting edges can be retracted hydraulically and the drill pipe is supported on the guide strips, which are made of plastic in the skiving drill head. This measure prevents withdrawal marks from damaging the surface.

Highly alloyed, temperature-resistant materials are normally extremely difficult to machine. On the one hand, the production-related scale crust creates an additional hardness to the cutting plates. On the other hand, the tool must overcome two additional hurdles. Centrifugally cast pipes with a long length are not available in one piece. The manufacturer supplies 3m long raw material that the user welds together. Welding requires a certain degree of precision. The seam must at least cover the area where the chips were removed so that a smooth surface remains after processing. In particular, the hardening of the welds represents a major challenge for the deep hole drilling machine. Thanks to the special and highly durable machine concept, TBT Tiefbohrtechnik can control this challenge and thereby makes a decisive contribution to process reliability.

Machine concept ensures long tool life

Basically, long machining lengths in conjunction with a layer of scale and other material irregularities are bad for tool life. But this doesn't matter with the machines from TBT Tiefbohrtechnik. The B series and the ML series are deep hole drilling systems designed for high stability. A whole range of design features have the task of dampening vibrations. This includes a machine bed with a special reinforced concrete filling. Other components also received a particularly stable design. The rack for the feed, for example, has helical teeth, also to minimize vibrations.

In addition to high stability, the machine also offers optimized handling. Since the pre-drilling is carried out by pulling, the pre-drilling head must be mounted after inserting the drill pipe. Thanks to a specially designed tailstock, this assembly is very easy. The tailstock is accessible from the rear, even the largest tool fits through for assembly. TBT Tiefbohrtechnik customers appreciate this convenience.

TBT Tiefbohrtechnik GmbH + Co, a History

Founded in 1966 in Dettingen on the Erms, Germany, specialising from the start in the niche competency of "Deep hole drilling". Thanks to this future-oriented manufacturing technology, the company was able to develop in the critical customer sectors over a relatively short period of time. The strategy of supplying machines, tools and services from a single source proved to be a decisive factor in terms of competitiveness. The fact that the company was able to develop so quickly can be attributed to three criteria for success which lie at the heart of company policy:

- The quality of its products, which benefits customers in terms of high process safety and low risk of failure.
- The high level of precision which these machines exhibit while in operation. For the customer, this can be seen in the optimal manufacturing results obtained, enabling them to become a price / quality leader in their commercial markets.
- Keeping close to customers, which allows TBT to recognize their clients' problems and develop specific solutions for these issues.

This unique approach, which has proved decisive in terms of competitiveness, has helped TBT Tiefbohrtechnik win, not just in the German market. Demand has grown both from within Europe and even from other continents. TBT Tiefbohrtechnik has reacted to this demand by building a global distribution and service network and now has subsidiaries and representation from the USA to China, in every industrialised country in the world. The reputation which TBT Tiefbohrtechnik enjoys amongst its customers is based, above all else, on their engagement and flexibility as well as their ability to innovate when making client projects a reality. This had led to TBT Tiefbohrtechnik´s position as worldwide market leader in the deep hole drilling sector. The repertoire is rounded off with membership of the Nagel Group, which includes the companies Nagel, Gehring, Kadia and O.erre.pi. This means that TBT Tiefbohrtechnik is also able to offer subsequent processes such as honing of deep holes or grinding of bearings.

If you would like to know more about the topics discussed in this article, or about TBT Tiefbohrtechniks solutions, please contact them at:

TBT Tiefbohrtechnik

W: www.tbt.de

E: info@tbt.de

T: +49 7123 976-0