made in Germany

FINEST PRECISION FOR HEAVY LOADS

SCREWS THAT ARE MANUFACTURED BY WHIRLING (MANUFACTURING PROCESS) PROVE TO BE THE RIGHT CHOICE FOR LIFTING JACKS USED IN THE RAILWAY MAINTENANCE SECTOR.

THE EXPANSION OF a high speed rail network is progressing in Europe. The French railway company SNCF is about to develop its TGV (high speed trains) trains in a new generation, just as the German Deutsche Bahn is doing. Even a private competition is rising in the ring of Italy against the "Frecce Rosse" and from year 2014 there will be a high speed link from Cologne to London. Also Russia plans to develop a network of high speed train services for the 2018 FIFA World Cup such as 300 to 400 km/h high speed trains from Moscow to St Petersburg, to Nizhny Novgorod and to Kazan, with a possible extension to Yekaterinburg.

All these trains are serviced at frequent intervals and for this reason; they have to be lifted completely. The threaded spindles or screws used in the lifting jacks for the maintenance of trains must be able to withstand extreme loads and on the other hand, work precisely in order to prevent jamming. Here, the whirling process has established itself as a superior manufacturing process for the screws, as proven by the success of Bornemann Gewindetechnik GmbH. Since the past few decades, the experts at Bornemann (www.bornemann.de) in Lower Saxony, Delligsen developed an expertise in the manufacturing of threaded spindles for lifting jacks for railway equipment. In this market segment, the company supplies several reputed manufacturers of lifting jacks for trains in Europe as well as overseas. The high quality of the screws that could be achieved through the whirling manufacturing process has been crucial to the market success of Bornemann.

Above floor train lifting system in Kaohsiung, Taiwan

THE WHIRLING METHOD – SUPERIOR QUALITY THROUGH AN INTERRUPTED CUTTING PROCESS

THIS THREAD WHIRLING process causes a rippled surface on the spindle body barely visible to the nacked eye through an interrupted cutting process. The applied lubricant remains in the fine depressions found on the metal surface. Due to this, the dreaded Stick-Slip effect is prevented even with heavy loads: When heavy loads are applied the surface of the threaded nuts is eventually grinding-in and the contact surface to the spindle gets too smooth. In doing so, ultimately the lubricant is pressed out from the gap between spindle and nut and leads towards blockade. This effect occurs especially with threads made by rolling process, which are manufactured with less precision by the method of cold deformation. They do not have the microscopic slots or lubrication pockets which are always present with threads manufactured by whirling.

"The threaded screws that we manufacture are very precise due to the whirling method and can realize a very good synchronized speed when it is necessary to lift several lifting jacks in parallel, as it is required for train sets or multiple units (DMU's or EMU's). Our spindles have an accuracy of 0.5 millimeter over a length of 5,000 millimeter," says Moritz von Soden, Head of Sales at Bornemann Gewindetechnik (www.bornemann.de).

In contrast, threads made by rolling process have an accuracy of +/- 2.5 millimeter on a length of 5,000 mm. "This means that, a height difference of 5 millimeter between two lifting jacks could occur. A huge impact when you consider the unbalanced weight of more than hundred tons" says von Soden. For the maintenance of complete trains, it is highly important that all the lifting points must be evenly raised. The replacement of bogies is increasingly being done in the "light maintenance" in nearby workshops and not during the so called "heavy maintenance" every couple of years. Thus in doing so, the workers in the workshops need to know the default settings of the loads with which the body of the coach will finally rest on the bogies in order to adjust the springs of the bogies accordingly. This weight is obtained by weighing the corner loads of the train carriages which can be done with a lifting jack that is equipped with a force measuring device.

"For this reason, a highly accurate height adjustment of the lifting jack bracket is required. Precisely manufactured spindles as done by the whirling process make this a whole lot easier" says Professor Wolfgang Rösch, Rail Expert and Managing Director of the business consultancy RöschConsult Group, which specializes on projects in the train maintenance sector. Thus, the lifting jacks are increasingly being used as measuring equipment for the exact lifting of the coach bodies and their weight measurement. "Whirled threaded spindles hereby offer clear advantages on the basis of their substantially lower manufacturing tolerances," adds Wolfgang Rösch.

EXCELLENT LUBRICATION CHARACTERISTICS

ALSO FROM AN ECONOMIC PERSPECTIVE, THREADED SPINDLES manufactured by the whirling method provide an advantage for lifting jacks: "Due to the absence of lubrication pockets rolled spindles require far more lubrication than spindles made by whirling process, that is a fact. In order to overcome the disadvantageous lubrication characteristics of rolled spindles, in earlier times, people simply resorted to using rolled spindles of greater diameter. This way they had a load reserve and did not reach the maximum contact pressure per unit area in which the lack of lubrication plays such a crucial role. However this extra expenditure is not economical with 20 or more lifting jacks which are nowadays needed to to lift complete train sets. Instead the use of whirled threaded spindles with excellent surface quality proves to be far more economical in terms of the unit cost of the lifting jacks."says Moritz von Soden.

"Based on the ever increasing trend to lift complete trains in 'one go' we can also confirm that our customers more and more utilize the complete lifting capacity of our lifting jacks. Load reserves are getting smaller and smaller and lifting systems are increasingly designed for very specific train types with defined loads. Therefore it is crucial for us that the performance of our lifting jacks is not compromised by lubrication problems when we reach the maximum contact pressure per unit area" says Clinton Capelli, Engineer at Vector Lifting which supplied one of the largest lifting jack installations worldwide with 24 x 4 post lifts at the train depot in Kaohsiung, Taiwan.

Lubrication pockets on the screws avoid the Stick-Slip Effect

When using rolled spindles the risk of the Stick - Slip effect can be can be reduced or camouflaged by means of a continuous lubrication system, but this obviously requires far more effort than a once lubricated thread and increases the running costs of the lifting systems for the train depots. Here also, threads made by the whirling process provide a technically more elegant solution as the lubrication intervals are drastically reduced.

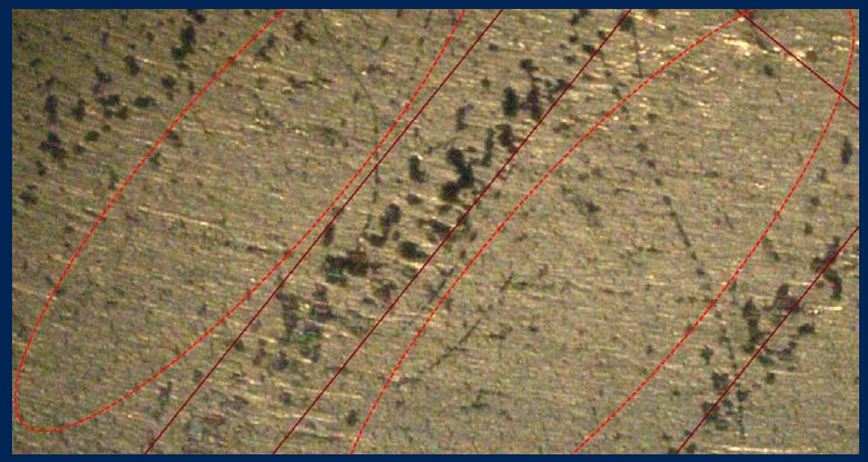
LESS RISK OF MICRO CRACKS – A POSITIVE IMPACT ON YOUR FMEA

LAST BUT NOT THE LEAST, the risk of micro cracks is also reduced with whirled threads. The manufacturing process of rolling threads is a method by which an imposed deformation under pressure is applied to obtain the thread profile. However this cold rolled deformation process requires threads to be subsequently corrected afterwards by truing, a lengthy correction process to ensure the straightness of the material.

As the cold-rolled deformation process already introduced tensions into the material and hardened the surface of the material the subsequent truing can lead to the formation of microscopic cracks. These cracks can then grow rapidly under the extreme pressures stemming from the rotational bending force when the lifting jacks are in operation, and therefore lead to a reduction in the operational safety of the complete lifting jack system. Furthermore as the cold rolling deformation process is squeezing the steel into shape, existing micro cracks in the material can be covered-up and are therefore much harder to identify. Whirled threads, in which the fiber of the steel is cut and not deformed, do not require a subsequent correction process, especially if normalized steel is used. This in turn can have a positive impact on the FMEA (Failure Mode and Effects Analysis) of the lifting jack manufacturer as the overall occurence of micro cracks can be reduced.

Bornemann Gewindetechnik (www.bornemann.de) has been manufacturing threaded spindles and nuts for various industrial purposes for more than 25 years. One key focus of the manufacturing is the production of large diameter ready-to-use trapezoidal threaded screws, consisting of spindles and the corresponding lifting and safety nuts for the use in heavy lifting technology applications such as railway lifting equipment, stage technology, penstocks and slide gates for dams or water reservoirs. Whenever great pressure is applied – Bornemann threaded spindles prove to be the right choice.

Detlev Karg, Specialised journalist in Cologne and Stockelsdorf. ■



Picture of the thread surface of a 12t lifting jack after the initial "running-in". It is clearly visible that there is no mechanical flattening in the valleys of the micro pockets where the lubricant is being stored. These excellent lubrication characteristics are typical for screws which are manufactured by the whirling process and this surface is the secret of how to avoid the dreaded Stick-Slip effect.

www.bornemann.de/en

BORNEMANN
Gewindetechnik

Bornemann Gewindetechnik GmbH & Co. KG
Klus 3, 31073 Delligsen
Tel.: +49 (0) 5187 - 94 22 0
Fax: +49 (0) 5187 - 94 22 74
info@bornemann.de, www.bornemann.de