SAFE TIGHTENING ON DIESEL ENGINES

CASE STUDY: MAN ENGINES-SCREWED CONNECTION

MAN diesel engines are used in various fields. Whether in the company's own trucks and buses, utility vehicles of third-party providers, in cogeneration units for electricity as well as drive in agricultural machinery, rail vehicles, vessels and special vehicles. Innovative technology and outstanding quality are the key elements for the success of the MAN engines. Prototype production and service teams however faced a challenge in the maintenance of the engines. More about this in the following section!

COMPANY PROFILE

MAN-Engines is a leading company in the field of development, construction, production, distribution and service of efficient diesel and gas engines from 37 kW up to 1.397 kW (50 PS up to 1.900 PS) for the most varied applications in many industries. The MAN location Nuremberg is the international engine competence center of the MAN Truck & Bus AG.

INITIAL SITUATION

A significant bolting process during the maintenance of the MAN diesel engines is the tightening on cylinder heads. A rough distinction is made between two engine programs: "New" and "old" MAN diesel engines. The main difference of tightening is the level of the torx screws on the cylinder heads. To carry out adequate maintenance, after the removal of the cylinder covers, first the torx screws (see picture 1) have to be loosened and later on tightened by means of the torque/angle method with specified values.

The old MAN engines require a torque of 80 Nm – 100 Nm + 90° + 90 + after 1000 km 90°, in several steps. The new engines require a torque of 300 Nm + 90° + 90° +90°.

Figure 1: MAN Motor

Until today a torque wrench had been used on these bolting connections. For our customers, in this case the staff of service teams or even of the prototype construction, this meant great force and high time resolution without accurate repeatability and lower joint quality. In addition, this screw application was a considerable challenge due to the given installation space. The problem which our fellow field worker (technical support – region Bavaria) faced was that a standard reaction arm could not be used.

Therefore it was not possible to ensure the correct support resp. ensure the safe and reliable torque value.

SOLUTION

In order to display the required torque/angle method with the requested values the models EFCip 10 (60 Nm – 420 Nm) and EFCip 30 (150 Nm – 1050 Nm) in the PLUS version were presented to the customers. These ensure a permanently higher joint quality compared to ratchet torque tools due to continuous rotation of the square drive. For our customers especially the repeat accuracy of ±3 % exceeds the accuracy of a torque wrench by far.

alkitronic® torque multipliers persuade because of a repeat accuracy of ±3 %

Another advantage of the alkitronic torque multiplier, according to our contacts, is the ergonomic operation and the considerable saving of effort and time which in turn contributes to the reduction of personnel workload. After selecting the suitable electric torque multipliers a solution had to be found for the challenge regarding a perfect, safe and sustainable absorption of torque. Thus a special support was designed. The aim of all parties was to develop a support which offers an accurate and permanent high joint quality.

Together with the involved service staff a torque transducer, adapted to customer's wishes and requirements, was designed based on these assumptions. After many prototypes two special supports were made – a special sliding support (engines OLD/NEW ref. no. 11495) and a special Y support (engines OLD ref. no. 11496).

SPECIAL SLIDING SUPPORT

After disassembly of the cylinder heads all required bolts are accessible at one level. Place torque multiplier on the relevant torx screw and adjust torque transducer on the next torx screw. Due to the sliding mechanism the customer can make up for the varying bolt spacing.

Figure 2: Special Sliding Support

Figure 3: Special Sliding Support

Figure 4: Special Sliding Support

SPECIAL Y SUPPORT

The “old“ MAN engines, due to the heater plug, have a by 80mm lowered bolt. Thus, not all bolts are level. To open the bolt in front of the heater plug an additional special Y support next to the special sliding support is required. The special sliding support is used for the remaining bolts.

Abbildung 5: Special Y Support

This case has again shown that company alki TECHNIK is a reliable, flexible and solution-oriented partner.

FURTHER INFORMATION

If you have any further questions on application resp. special situations, please contact us. Our employees at home and abroad will have customized solutions for you which will let you accomplish your tasks securely, fast and reliably.