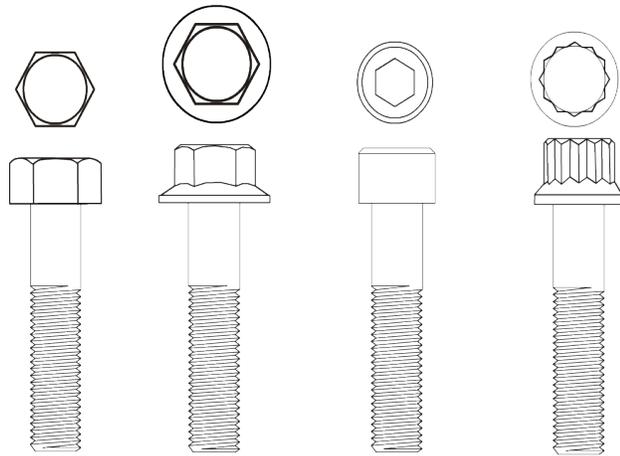


Estimation of friction in bolted joint



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Target:

The goal of the thesis project is to estimate friction in bolted joints in real time during tightening. The estimation is based on previous runs of tightening in similar applications.

Background:

Clamp force is the variable that is the real need for a joint to withhold external load, and to secure the integrity of the joint. However, to control and monitor a tightening process, it is common to measure torque. Torque is mainly dependent on friction and unfortunately only partly on installed clamp force. Clamp force is in fact more closely dependent on rotational angle.

If friction is constant, torque is proportional to clamp force. However, it is well known that friction varies with speed. What has been noticed lately is that friction also might vary a lot due to other reasons, specifically during a pulse tightening (tightening is completed within a couple of milliseconds). Controlled pulse tightening is becoming increasingly important for our customers, out of several reasons. It is therefore very important to keep track of friction.

Mission:

Your mission is to estimate friction and, in the end, the clamp force. The analysis should be model based with a dynamic model relying on existing signals such as torque, rotational angle and current. A change detection in the friction is also desirable, i.e., finding when friction starts deviating from constant.

Qualification:

In order to be able to contribute to this project the student shall be a highly motivated and creative person. The person shall have a high interest in hardware, both mechanical and electrical, as well as software. The student should also have knowledge in modelling, signal processing and detection theory. Suitable background is Master of Science program E, F, M, Y or equivalent.