

Gear Rating

THE QUESTION

In order to realize meaningful savings using low-cost gear motors, some gear motor manufacturers are sizing the gears with safety for stress at single tooth contact S_H min below 1.00; i.e. — minimal S_H 0.82 — according to Calculation Method DIN 3990; Method B. Is this possible? Will the gear life be limited?

Expert response provided by Frank C. Uherek, principal engineer, Rexnord Gear

Rating methods have safety factors based on flank (pitting) labeled as S_H and root (bending) labeled as S_F . They are computed as the ratio of the modified allowable stress number to the actual stress number. These values are a function of tooth geometry, method of manufacture, material, heat treatment, and application. If we assume an application factor K_A of 1.0 based on the use of the product, a safety factor of 1.0 is based on 5×10^7 load cycles when pitting is not permitted. A value of S_H less than 1.0 may be based on using some of the de-rate in power

capacity caused by an application factor greater than 1.0 in the actual stress number calculation. Loading, application factor, number of load cycles, and minimum safety factors are subject to client/vendor agreement — as noted in the standard — and should be carefully reviewed to ensure the expected performance of the gear drive in the specific application.

A detailed review of the application and all factors used in the rating analysis would be required to determine the origin of the safety factor being less than 1.0 in this case.

Frank C. Uherek is

principal engineer/mill products for Rexnord Geared Products in Milwaukee WI. In over 30 years he has held various positions in design engineering and quality management, including enclosed drives, wind turbine drives, and open gearing for mill and kiln applications. He has served on numerous AGMA technical committees, including as vice chairman (and editor) of the Helical Gear Rating Committee, and received the AGMA TDEC award in 1997. In 2011, Uherek received the AGMA Distinguished Service Award for his work in developing AGMA gear rating standards.

