

MAS 413 Machine Technical Systems

Design of a gearbox

Candidates: Ole Tobias Næss, Thomas Lønne Stiansen, Adrian Mathias Lervik Ling and Ruben Kristoffer Helgestad

For one customer we are asked to design a gearbox for use in conjunction with a piston pump with several cylinders. The gearbox is driven by an electric motor and a requirement is that the piston pump should be in operation for 8 to 10 hours per day.

For the gearbox the following requirements are provided:

Speed of the input shaft 1:	$n_1 = 1450 \text{ rpm}$
Effect on the shaft:	$P_1 = 12.5 \text{ kW}$
Total gear ratio:	$i_t = 17.3$
Pressure angle:	$\alpha = 20^\circ$
Helix angle:	$\beta = 15^\circ$

In addition, all the gears should be fastened to the shafts using interference fit. The couplings between the electric motor and the input shaft, and between the output shaft and the equipment are flanges. The flanges are attached to the shafts by keys. One can assume that the box is made of cast iron and the construction and detailing of the complete box is therefore outside this task.

But a detailed design using FEA is required for the highest loaded "middle" shaft, and also the part of the housing where the bearings are attached.

So the job is to select the concept, design individual items and document the work. The report shall include product specification, number of steps and calculations of: the gear ratio per step, dimensions of the gears, stresses in the shafts, the deflection of the shafts, interference fits, key connections, choice of rolling bearings, etc. etc.

Create construction drawings of the gearbox (ie, minimum total assembly drawing and detail drawing of the incoming shaft). Drawings could be done in SolidWorks, AutoCad or sketched by hand. The report can for example be written using MS Word.

Basis: Issued materials.

Out: 21.01.25
In: 10.04.25