KONGSBERG

Problem Proposal 2 for MiMM 2021, Kongsberg Maritime Sweden AB

Propeller shaft line optimisation

Kongsberg Maritime has developed advanced design tools over the years and the engineers are able to configure shaft lines for different kinds of vessels, from small fishing boats to very large and complex naval hangar vessels.

Now we you are to improve the design tools by automating the process of placing radial bearings. Placing bearings might seem as a fairly simple task when done manually for a specific shaft line, but to come up with a general approach that works for all kinds of shaft lines is something else.

Task: Place radial bearings automatically

You are to find a general approach that place radial bearings on any shaft line, automatically. Use the provided shaft line as an example.

Note: There may be cases where radial bearings cannot be placed sufficiently according to the design rules since this task is a simplification.

Prerequisites: Design rules

When placing radial bearings, one need to do proper whirling and alignment calculations, but that's out of scope for this task. Instead, we work with simple design rules.

Slenderness ratio (L/d), length between bearings divided by the smallest shaft diameter between the bearings. The slenderness ratio design rule: 10 < ratio < 25.

Geometrics of components. All components have a length, but also a specified dismounting space that makes the component demand larger space than its length. Geometric design rule: Obstruction of components is not allowed.

No go zones. Sometimes there are other components that makes it impossible to place a radial bearing (marked by gray zone between vertical lines below). No go design rule: Obstruction of zone is not allowed.

Example