

# **Assembly Optimization for Double Row Ball Bearings**

by

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## **Abstract**

This thesis is a treatise on optimal assembly methods for double row ball bearings. As with common single row bearings, double row ball bearings, consist of four general components, namely, an inner ring, an outer ring, a complement of balls and a cage or retainer to keep the balls separate. Unlike single row bearings, however, double row ball bearings have two complements of balls in two distinct parallel races. Although this double row configuration is desirable in a number of applications, it makes the bearings more difficult and expensive to assemble. In addition, current manual assembly procedures require a great deal of digital manipulation, leading to concern about carpal tunnel syndrome and other long-term repetitive motion injuries.

This thesis attempts to develop an improved assembly process for all types of double row bearings. Although the work is intended to be general, the Torrington 5203 double row ball bearing is adopted as a specific application example. This bearing's assembly difficulties and additional cost are a result of its manual Conrad assembly method and a rubber O-ring and groove used solely for bearing assembly. In the assembly process, the O-ring supports the upper balls temporarily until the two rings can be aligned concentrically, thus snapping the balls into the bearing races. This thesis addresses the replacement of the rubber O-ring and explores opportunities for bearing assembly automation.

Design synthesis of a retractable or reusable assembly component to replace the rubber O-ring supporting the upper balls during assembly is presented. A large group of design concepts are developed and evaluated, resulting in a small group of feasible

designs. These feasible solutions are then tested, and a design that has the potential immediate implementation in an improved manual assembly process is proposed. In addition, two design concepts are presented as candidates for possible implementation in an automated assembly process.

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