

# Smart Monitoring, Automated Foresight

“Condition monitoring”, permanent monitoring of the machine condition, and “predictive maintenance”, machine-learning-based prediction on the basis of data – the team around Dr. Benjamin Adrian has built up expertise in these focal areas. Here, mathematics and AI provide tailored solutions. One practical example is the collaboration with Berger Holding (Memmingen Allgäu), where everything revolves around ball screws.

Predictive maintenance is the optimal maintenance strategy.

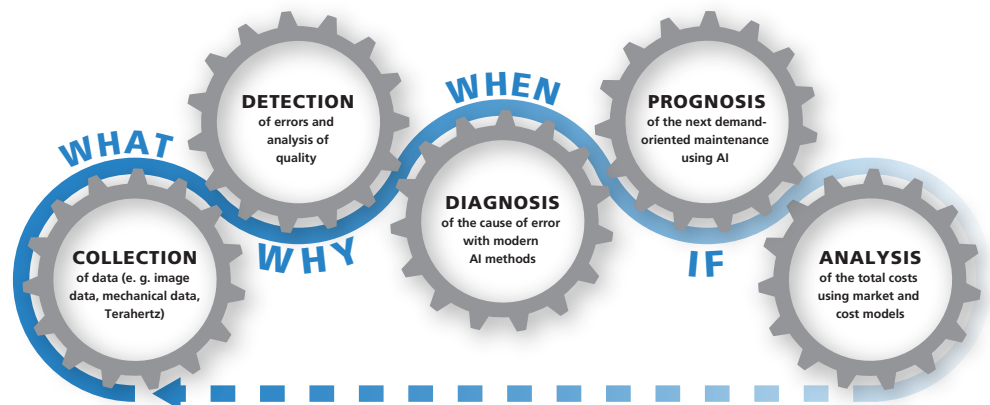
A ball screw is installed in machine tools, for example, and is used in the automotive industry, measurement technology, medicine, and aerospace. Large forces act on the component and the service life is related to the load on the balls. Maintenance and avoiding failures are production goals – preferably automated and smart.

form comparative measurements or have them performed automatically and observe how the profile has changed. This data answers questions such as: Is the ball screw installed correctly? How does the condition change? When does the ball screw need to be replaced?

### Goal: A ball screw that controls itself

In the project, this means proceeding step by step for the team: “Based on sensor data and their complex analysis, we calculate the profile, virtually the fingerprint of each ball screw in as-new condition,” explains Adrian, project manager at the “System Analysis, Prognosis and Control” department. This profile serves as a reference. Ball screw operators can then per-

“We are not just looking at data itself, but examining where it comes from. We want to understand exactly what the data is telling us and how it is created. Also with our experience around sensor technology.” Based on this, the testing station and measurement technology are being expanded and a concept for moni-



Condition monitoring and predictive maintenance: data acquisition, analysis, prediction and evaluation from a single source.

**“We will be able to improve our quality control through the cooperation with Fraunhofer ITWM and save our customers rejects and unplanned machine downtimes.”**

**Dr. Martin Körner**

Development engineer at Berger Holding



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*Project example Berger: Digitization of a ball screw. A ball screw translates rotational motion into translational motion and vice versa.*

toring is being developed (condition monitor). In Berger’s case, this now means its own software.

Berger is pushing ahead with this further development of ball screws as part of the “Pay-per-Stress” project sponsored by the German Federal Ministry for Economic Affairs and Energy. The goal is to introduce a new leasing model for machinery and equipment whose rates are calculated not only according to useful life, but also to actual wear and tear. This

requires a reliable wear model for each critical machine component, such as the ball screw. This increases the transparency of costs and reduces risk surcharges in the leasing rate. This makes the concept equally attractive for small and medium-sized companies with limited financial resources. The end user also recognizes faulty assemblies or where problems need to be fixed and can look ahead to see when they need to renew or replace a part (predictive maintenance). Berger’s major goal is a ball screw that monitors its own wear.

### Contact

Dr. Benjamin Adrian  
 Department “System Analysis,  
 Prognosis and Control”  
 Phone +49 631 31600-4943  
[benjamin.adrian@itwm.fraunhofer.de](mailto:benjamin.adrian@itwm.fraunhofer.de)



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[www.itwm.fraunhofer.de/en/predictive-maintenance](http://www.itwm.fraunhofer.de/en/predictive-maintenance)