



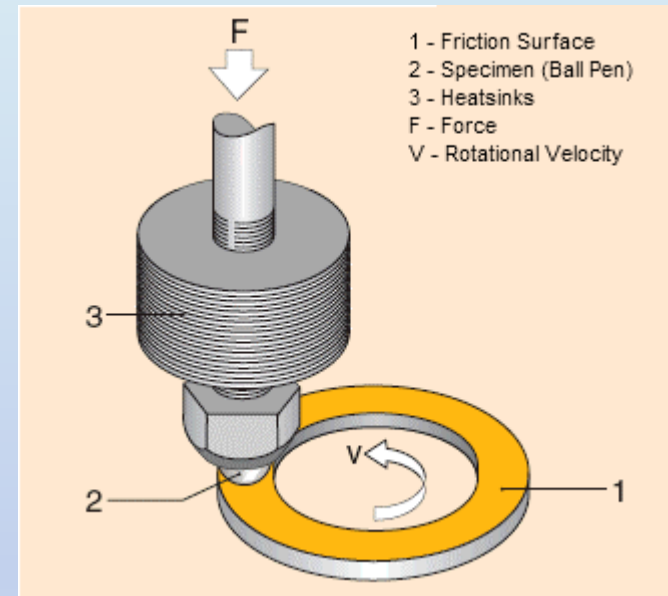
**Analysis and simulation of friction and wear processes  
using sliding stress – Universal tribometer**

**TÜV Thuringia examination extracts**



The **Universal tribometer type TRM 1000** used to study and simulate friction and wear processes with sliding stress.

During friction value measurement a stationary sample test specimen (pin of 100Cr6 steel) is pushed by a defined force against the front surface of a rotating disk (100Cr6 steel). Both parts are vertically arranged.



The test objective is demonstrate improved wear protection of a commercial engine oil of SAE 30 class using NanoVit Motor Renovator (NanoVit MR). The test is performed using a Universal Tribometer.

The test examines the effect of NanoVit-MR in the event of a loss of lubricant.

### **Preparation of NanoVit - Test Oil (MR)**

**Neutral Oil:** Calpam FE 10W-40 (SAE 30 grade)

**Additive:** NanoVit Motor Renovator

### **Test on Universal Tribometer**

Pretreatment: Storage of specimens in the NanoVit-GR - Test Oil

- Time: 120 minutes

- Temperature: 50 ° C

Test load: 300 N to 1,000 N / load level View

Lubricants: Additional continuous lubrication

Emergency shut-down: If you have high wear

## The problem

This test should be read in conjunction with the other previous tests, but especially the examination using Shell 4-ball machine according to DIN 51 350.

As a result of this examination it was found that even at the greatest force load available in the 4-ball apparatus (12,000N) no welding of the balls took place.

This investigation will now examine NanoVit additive oil after the demolition of the oil film layer and examine what wear protection is available. This is a so-called dry run in a pre-determined time window.

The results therefore provide information on NanoVit as an elastic long-term wear protection in more extreme environments. The results are important with respect to using NanoVit in situations where the dry running of lubricating media is important.

In this test a base oil of the type 10W40 (SAE 30) was used as it is not capable of emergency dry lubrication.

## NanoVit Gear Renovator

The NanoVit-Motor Renovator guarantees a long-term wear protection for engines up to 150,000km.

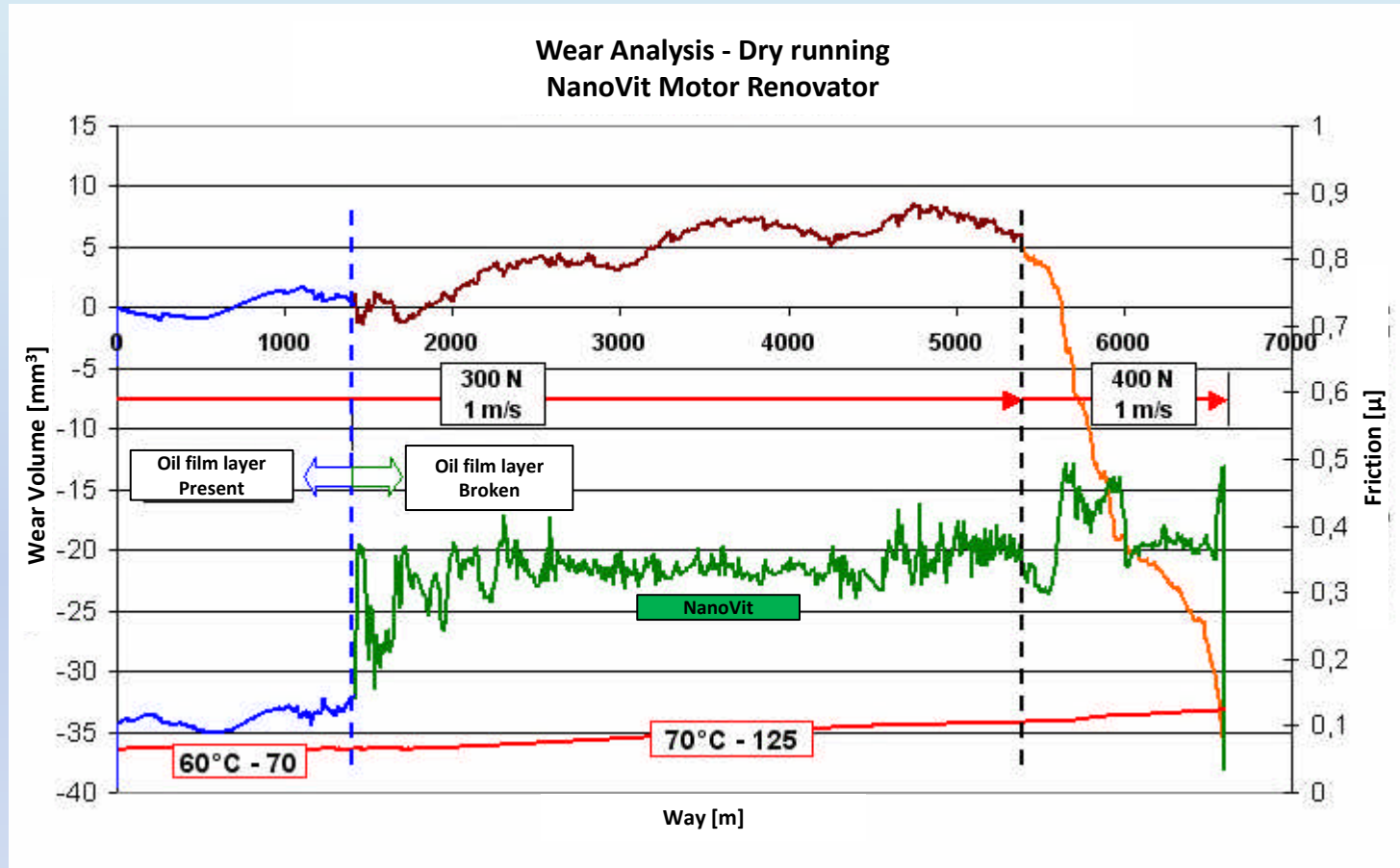
The specially designed active components ensure that the surfaces of the engine's moving parts are coated with a firmly adherent and elastic anti-friction surface with a long-lasting, structural effect.

The friction loaded metal surfaces in the engine now form a metal-organic connection, wear and friction are reduced and the lifetime of the engine is significantly extended and renewed.

NanoVit has no influence on the formulations and formulations of lubricants, and forms no rigid film layers. NanoVit is effective beyond oil changes.

NanoVit Motor Renovator for engines consists of 99.9% 10W40 (SAE30) and <0.1% NanoVit

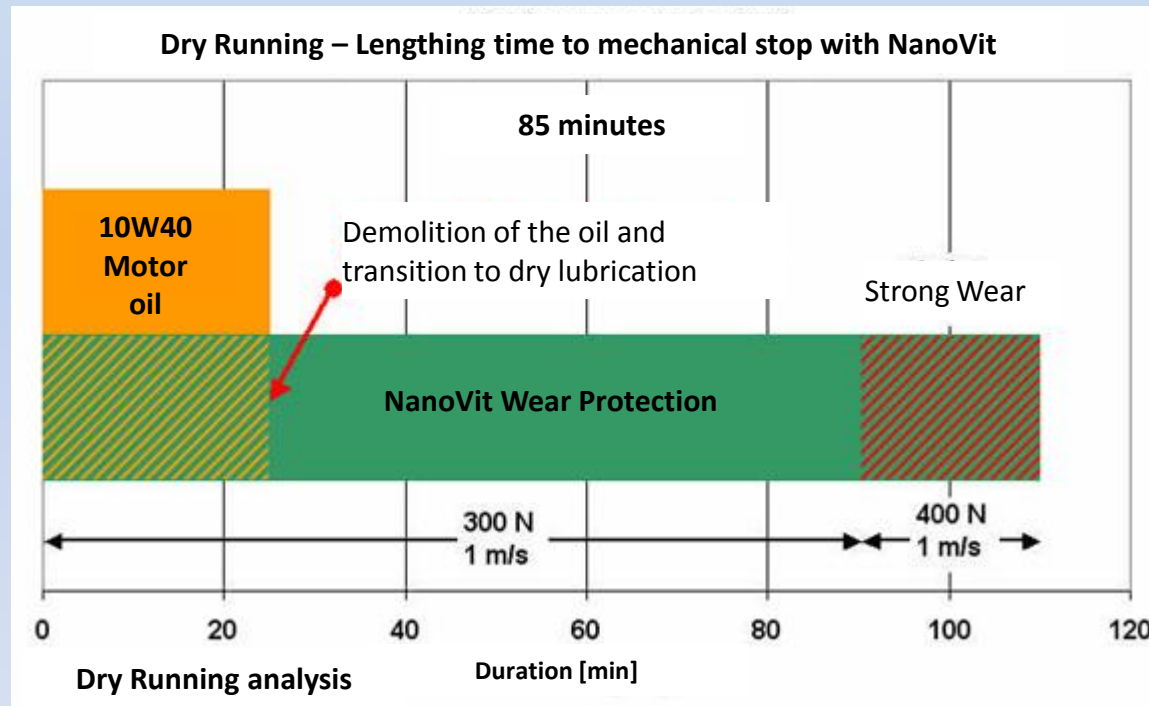




**Conclusion:** NanoVit delayed the mechanical seizure by 5,600 m / 85 min.

# Test results

The carrier oil 10W40 is a liquid lubricant of SAE 30 class. It is, by its physical nature, not a dry lubricant. Due to this a mechanical strain occurs at 300 N after approximately 1,500 m caused by the breakdown of the lubricating film. The frictional resistance increases, the temperature rises continuously. From 5,500 m, a significant wear is measured on the specimen. At 6,600 m the apparatus stops due to excessively high wear. The result show how NanoVit oil delayed the mechanical stop 5,600 m or 85 min. by providing protection after the oil film had broken.



## Conclusions / Summary

We have already shown in the previous tests, NanoVit builds a three-dimensional, tightly adherent, elastic, spherical network structure of 3 - 700 nano meters on the active friction sites.

We have demonstrated NanoVit is capable of protecting at forces in excess of 12,000N and that NanoVit improves wear protection properties in oils. This test shows that NanoVit is active and also provides protection and lubrication in dry-running conditions.