



Industry

Mechanical Engineering

Area of use

Laboratory

Customer

Wippermann jr. GmbH

Main products:

Industrial chains, sprockets

Employees:

270 employees

Locations:

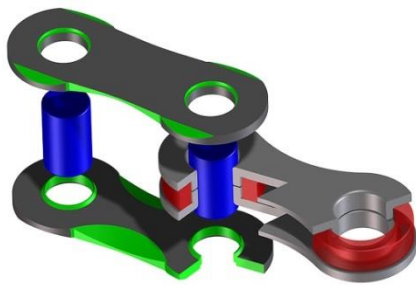
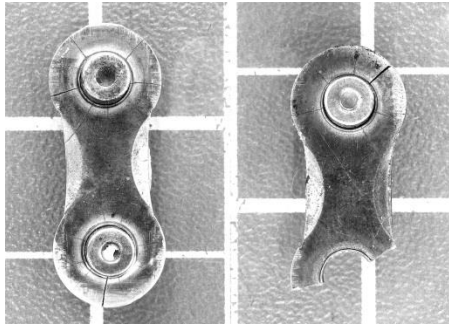
Hagen, Germany

Since 120 years, the name **Wippermann** has been renowned for products of the highest quality. Their **core competencies** comprise qualified consulting with regard to **drive and conveyance technology**. Together with their clients they plan and develop individual, demand-oriented solutions to implement them fast and precisely.

Owing to continuous investments in state-of-the-art technologies they are able to guarantee production processes on the **highest possible level**. The famous Wippermann quality is ensured by the use of select raw materials, by our high competence in processing semi-finished goods as well as by the application of sophisticated heat treatment and coating processes.



Requirement



Analyzing specimen geometries reliably and accurately

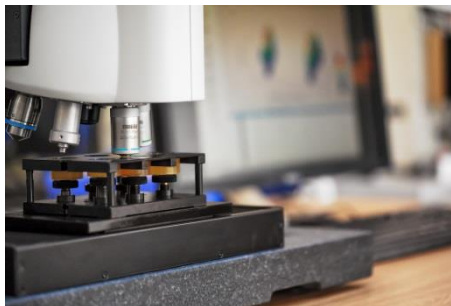
The **hydrogen-induced, delayed brittle fracturing of metallic materials** is of great technical significance. When considering the development of bicycle gear shifting systems, it becomes apparent that the increased number of chain sprockets in the cassette places more stress on the chain. Despite lower material thickness, the specifications for fracture loads and fatigue limits must be complied with, and later in operation the tremendous skew and peak loads must be tolerated when shifting gears. Combined with the tight fit between the bolts and outer plate, experience has shown that severe reshaping of the outer plate caused by various stampings and deep-drawn operations in particular presents an increased risk of embrittlement.

For chain manufacturers this presents **problems that need to be solved**, ones that call for a **very precise and fully automatic hardness testing machine**. While wear on a chain is easily predictable and measureable - there are wear gauges for this purpose - the fatigue fracture and hydrogen-induced brittle fracture of the chain side bar, which is made of highly tempered materials, presents an incalculable risk. This happens without warning, which can lead to a severe accident for the rider. This is aggravated by the fact that these fractures may occur in a delayed manner.

Overall the hardness testing machine must meet the following **requirements**:

- **Required methods:** HV0.3, HV1
- **High level of automation**
- **Ease of use**
- The **possibility to scan specific specimen geometries** and **to create a hardness profile similar to the FEM method**

Solution



DuraScan 70 – the fully automatic micro hardness testing machine & areaMASTER

Within the complex system of the manufacturing process, various measures could be taken to prevent cathodic stress corrosion cracking. Both the shaping of the outer plate and heat treatment were of crucial significance. Due to severe reshaping during the plate stamping process, there were **clear differences in hardness** within the material, especially in the area of punch holes and the shifting aid. This could **precisely be pinpointed** through the **use of the DuraScan 70** in combination **with** the software module **areaMASTER** with the **help of a hardness map** – a color image of surface hardness distribution. In order to reduce stress after cold forming, stress-relief annealing was added, which significantly reduced the subsequent risk of embrittlement.

The ease of use of the hardness tester, thanks to the **intuitive operating software ecos Workflow** developed by EMCO-TEST, **saves the user valuable time** during testing. All of the test methods are stored in the software, and they can be called up as necessary within the workflow. The **integrated conversion** of the measured hardness values into material thicknesses and other hardness test methods ensure a **clear visualization of the results**. In addition the **statistical functions** make it possible to ascertain all relevant parameters for production.

Why EMCO-TEST?



The **fully automatic function** of the DuraScan 70 as well as the selected **multiple specimen software module** make it possible to test several specimen consecutive. This facilitates both internal monitoring of heat treatment processes as well as the development of specific heat treatment procedures for components with highly complex shapes. The **speed** of the fully automatic DuraScan 70 combined with the **integrated conversion function** for hardness values makes the **fast and detailed description** of the findings possible, which are rounded off by the **statistics functions**.

"The fast and reliable functioning of the DuraScan 70 persuaded us on our first demonstration. By purchasing the new machine we have been able to draw detailed conclusions similar to the FEM method, conclusions which have had considerable influence on development at our company."

Dipl.-Ing. (FH) Matthias Richter – Wippermann Engineering