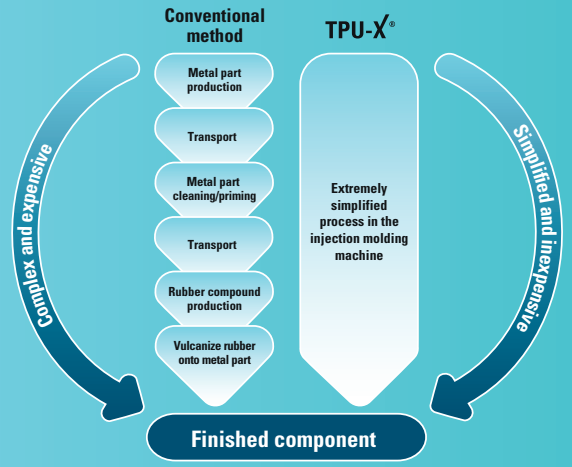
PATENTED PROCESS!

TPU-X® is used everywhere where high performance matters. Its enormous resilience and high temperature resistance makes this material unique. It thus makes heavy loads manageable in machinery and plant engineering.

TPU-X® opens up enormous potential to produce components that are not only high quality, but inexpensive. This is because the Hunold + Knoop patented process with the reactive online curing of TPU-X® in the injection molding machine makes the complex process of rubber processing a thing of the past.

Manufacturing process of a rubber metal part and a TPU-X® metal part in comparison:



TRIED AND TESTED!

The advantages of thermoplastic processing in combination with the rubber-like properties of TPU-X® opens up a completely new range of applications.

FIELDS OF APPLICATION ARE E.G.:

- ✔ Seal technology
- ✔ Gears (substitution of POM, PA, thus more flexible)
- ✔ Cylinders, rollers and shafts for the transport of paper
- ✔ Oscillation and vibration damping
- ✔ Agricultural machinery
- ✔ Commercial vehicle engineering, construction machinery sector
- ✔ Hydraulics industry
- ✔ Recycling and shredder equipment

"With the new TPU-X® sieve balls the output of our sieve systems has increased by 10-12%. The service time of the balls has even increased by 3 to 4-fold."

Graduate Engineer Heiko Sykorra, Managing Director of Briloner Hartstein Werk GmbH & Co. KG

"TPU-X® offers unbeatable advantages for many applications. Costs are lowered, and yet high-quality, robust parts are produced. Hunold + Knoop is doing valuable pioneering work here."

Hans Kampsen, Head of Sales and Techn. Service Automotive BASF Polyurethanes GmbH, Lemfoerde

Hunold + Knoop Kunststofftechnik

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Hunold+Knoop Kunststofftechnik GmbH
59590 Geseke
Werk I Corveyer Straße 5
Werk II Erwitter Straße 24
Telefon: +49 (2942) 9798-0
Fax: +49 (2942) 9798-99
info@hunold-knoop.de
www.hunold-knoop.de

TPU-X®

MAKE SHORT WORK OF IT!

BREAK THROUGH THE LIMITS OF YOUR PARTS WITH TPU-X®!

Patented and proven in practice!

- ✔ *EXTREMELY ROBUST*
- ✔ *TEMPERATURE RESISTANT*
- ✔ *SIMPLE AND INEXPENSIVE*

Hunold + Knoop Kunststofftechnik

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READY FOR YOUR CHALLENGE!

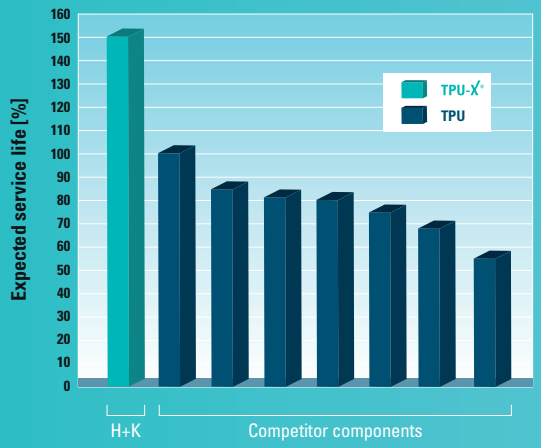
***TPU-X®** IS THE PREMIUM MATERIAL FOR HEAVY DUTY APPLICATIONS! COMPONENTS ARE OF HIGHER QUALITY AND YET MORE INEXPENSIVE!*

PROBLEM	SOLUTION
Thermal instability! Due to its thermal characteristics TPU quickly reaches the limits of its stress resistance. This critically limits its options!	**Outstanding thermal characteristics!** The special properties of TPU-X® enables significantly higher service temperatures. The material remains stable for a long time and softens considerably later than, e.g. TPU (see diagram).
Mechanical overload! Materials such as TPU and EPDM are only partially able to return to their original shape after being put under stress. Worn parts are the result.	**Extremely high "springiness"** TPU-X® has extremely high resilience (see bending test diagram on lower left). The rubber elastic characteristic also damps oscillations and vibrations. This ensures considerably longer durability (see graphic).
Too complex and expensive! Alternative rubber materials have a long process chain and are (mostly too) expensive.	**Short work!** The use of TPU-X® with online curing in the injection molding machine makes the process simple and inexpensive!

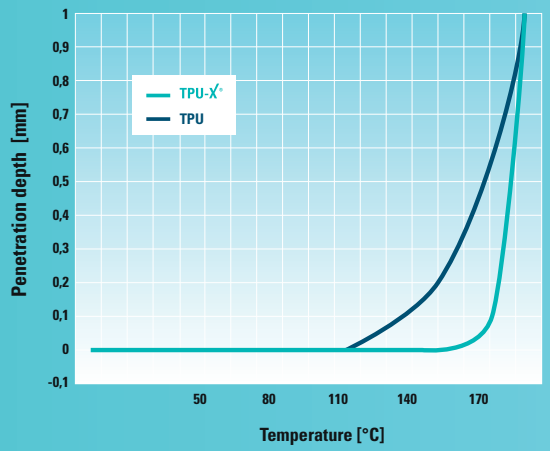
The advantages of TPU-X®

- ✔ Rubber-elastic and excellent dynamic properties
- ✔ Significantly increased durability under extreme conditions
- ✔ Extremely high resilience ("springiness")
- ✔ Lower wear
- ✔ Continuous operating temperature up to +120 °C (short-term up to +150 °C)
- ✔ Excellent oscillation and vibration damping (NVH)
- ✔ Drastically shortened process chain compared to complex vulcanization
- ✔ Short cycle times
- ✔ 2K material composites with other technical plastics and metals
- ✔ Settings from approx. 45 ShA to 74 ShD
- ✔ Oil and grease resistant, ozone resistant, odorless
- ✔ Storage stability in contrast to rubber
- ✔ Shot weights starting at 2 g possible
- ✔ TPU-X® is recyclable

Component service life in bench testing by a customer



Thermal characteristic TPU vs. TPU-X®



Bending test

(24 hr. at 70°C)

EPDM 85 ShA

TPU 85 ShA uncured

TPU-X® 65 ShA cured