

Intrinsic Strength Analyser

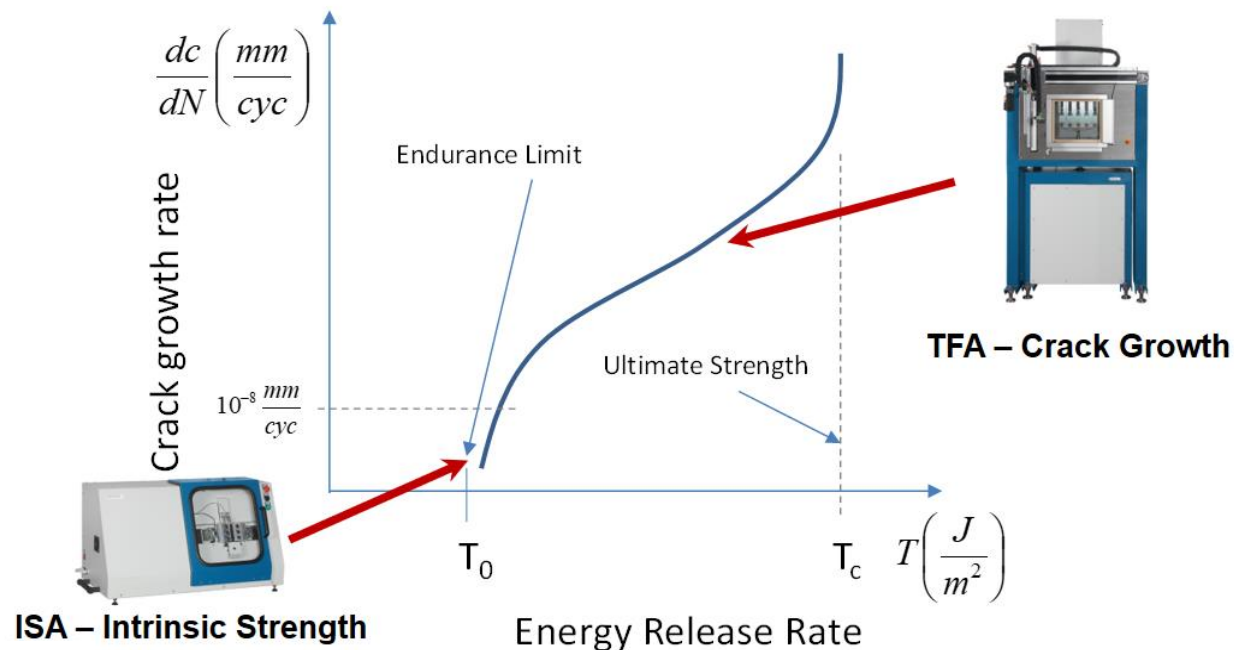
Automatic and fast measurement of crack initiating Force T0 according Endurica Protocols

www.coesfeld.com

Measurement Goal

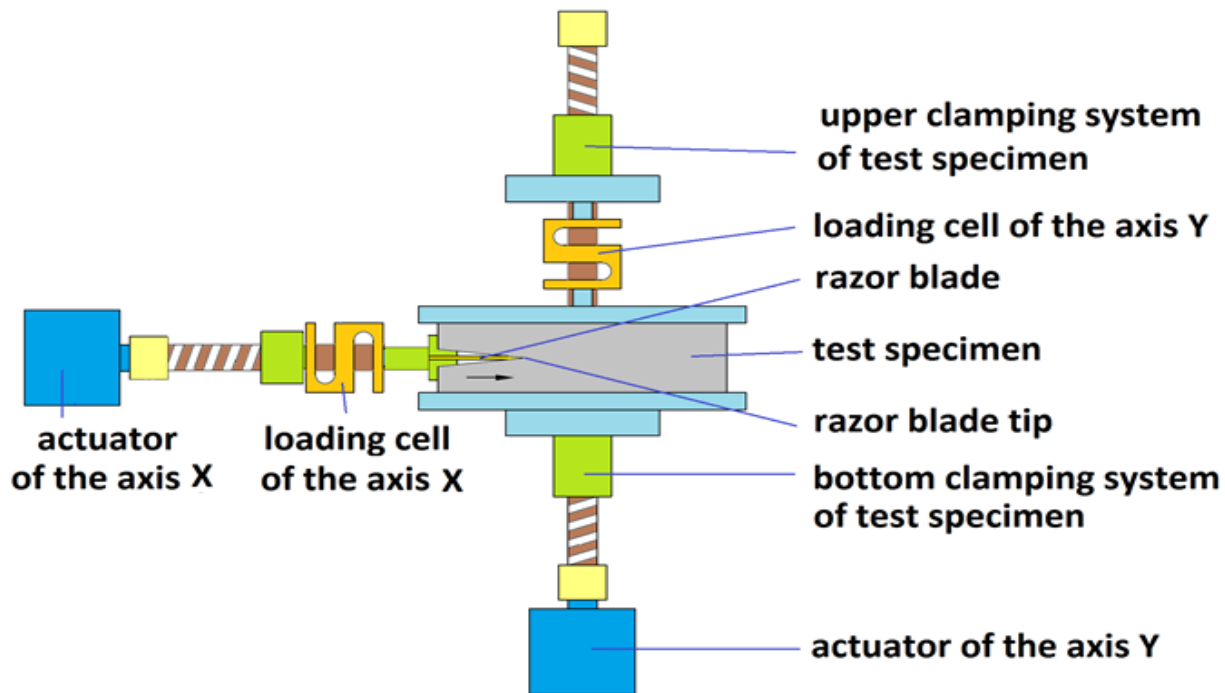
Prediction of operational lifetime of rubber products

by **evaluation of the minimum Tearing Energy T_0**
that initiates crack growth
and **evaluation of the critical Tearing Energy T_c**
that instantly drives crack growth

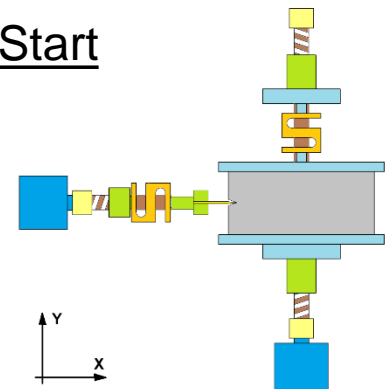


ISA - Instrumentation

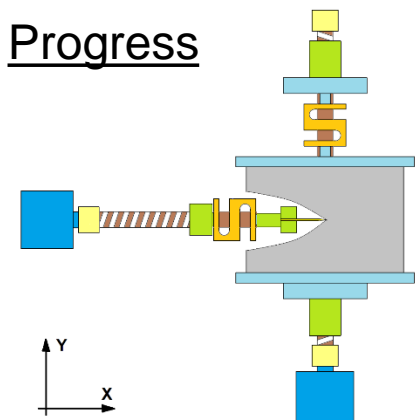
Instrumented Biaxial Set-Up



Start

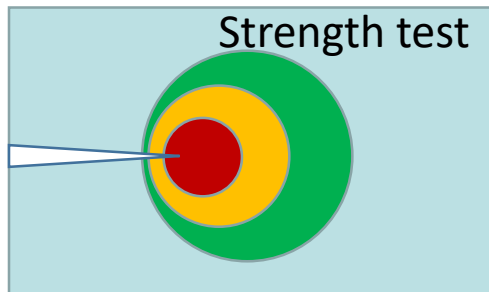


Progress



Background

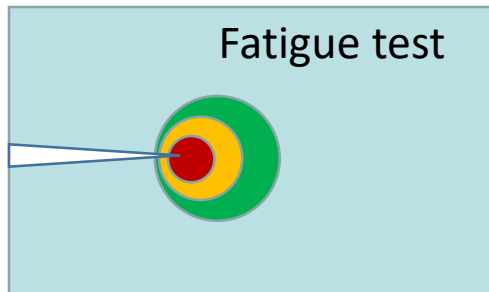
- **Slow Speed Isolates T0**



$$r > 10 \frac{\text{mm}}{\text{cyc}}$$

$$T = T_0 + T_z(\varepsilon, \dot{\varepsilon}, \theta, R)$$

$$T \approx 50 \frac{\text{J}}{\text{m}^2} + 50000 \frac{\text{J}}{\text{m}^2}$$



$$10^{-9} \frac{\text{mm}}{\text{cyc}} > r > 10 \frac{\text{mm}}{\text{cyc}}$$

$$T \approx 50 \frac{\text{J}}{\text{m}^2} + 5000 \frac{\text{J}}{\text{m}^2}$$

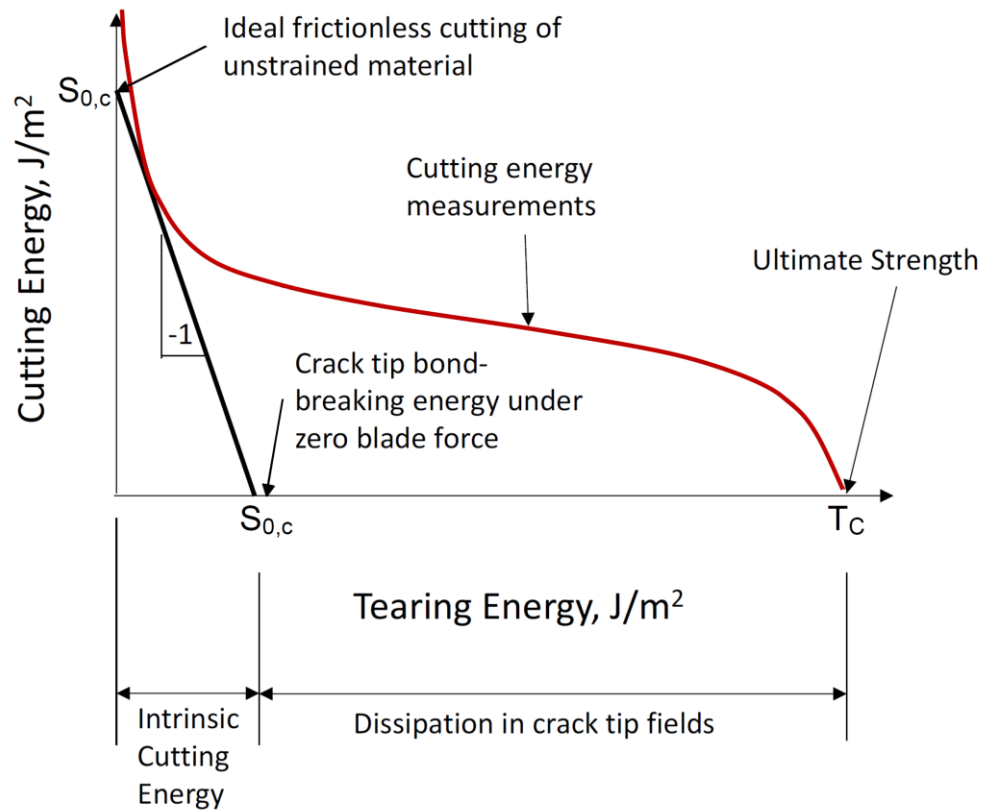


$$r = 0 \frac{\text{mm}}{\text{cyc}}$$

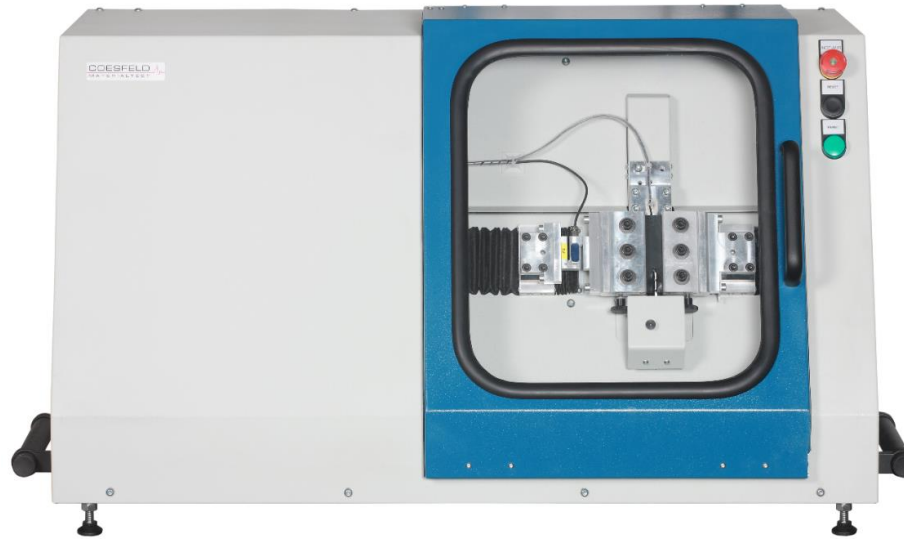
$$T \approx 50 \frac{\text{J}}{\text{m}^2} + 0.0005 \frac{\text{J}}{\text{m}^2}$$

Measuring Approach

- Determine $S_{0,c}$ from **F** versus **T** data
- Map **S0** to **T0**



Intrinsic Strength Analyser



- Standardized and straight forward Measuring Procedure
- Fast Estimate of Intrinsic Strength T_0
- Additional Measurement of T_c -Critical Tearing Energy of self-growing crack

Literature

Measuring Concept and Proof of Concept

2019_TSTCA_Characterizing Intrinsic Strength (Fatigue Threshold) of NR and BR

2020_AdvPolymSci_Fatigue Threshold of Rubber and its Characterisation using Cutting Method

Comparison to Crack Growth Data

2019_TireTechInternational_Characterizing durability of rubber for tires

COESFELD

MATERIALTEST



TESTING EQUIPMENT

for Plastics and Rubber

Coesfeld GmbH & Co. KG

www.coesfeld.com

Tronjestr. 8
44319 Dortmund

T +49 231 91 29 80-0
F +49 231 17 98 85

mail@coesfeld.com