

Various driving conditions result in typical wheel loads, stresses and cutting loads at different areas of the vehicle. The time history of such values cannot be calculated from the acceleration of the vehicles chassis directly. Instead a correlation between the acceleration of the chassis and the damage evolution caused by such loads, stresses and cutting loads especially wheel forces can be derived and determined by the Durability Transfer Concept.

The combined data analyser/data logger OCEAN ONE implements this new Durability Transfer Concept to efficiently perform long-term measurements on vehicles under test or in customer use. It acquires 3-axis acceleration data and analysis the data according to a unique combination of frequency analysis and the Rainflow algorithm. Together with the Durability Transfer Concept it enables the reconstruction of the progressive deterioration caused at the whole vehicle.

### The Key Features of OCEAN ONE:

- Connection of external, three-dimensional acceleration sensors, e.g.:
  - x: +/- 50g
  - y: +/- 10g
  - z: +/- 50g
- 1 extra channel, e.g. for the driving torque
- CAN channels, e.g. for the speed
- 50 Hz antialiasing filter
- 1000 samples/sec per channel
- 5 frequency bands
- 1 real and 15 virtual Rainflow channels
- 2D Time at Level counting
- 9 - 30 VDC power supply
- Small sized (11 cm x 9 cm x 6 cm)
- Optional: wireless data transfer
- Unlimited measuring time

### Online Counting Evaluation and ANALYSIS



OCEAN ONE is a joint venture of SWIFT and the FH Kempten to implement the **Durability Transfer** concept.



## Concept for Acquisition of Long-term Data, Stress Data and Load Data

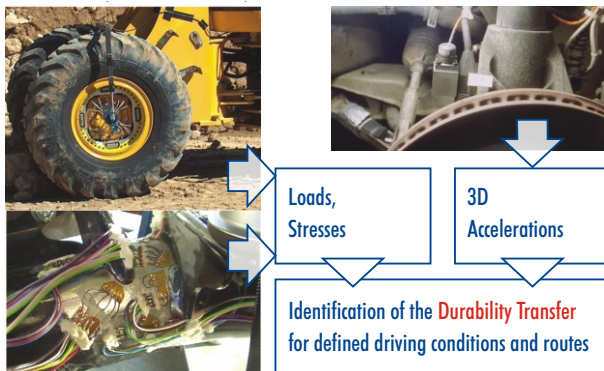
# DURABILITY TRANSFER Concept

### General

The *Durability Transfer* Concept is designed to efficiently carry out long-term measurements on vehicles under test or in customers use at affordable costs. It establishes a method to reconstruct the progressive deterioration over the whole vehicle by forces and loads - especially wheel loads. For the analysis only three axis acceleration data of the chassis filtered by several band pass filters is required.

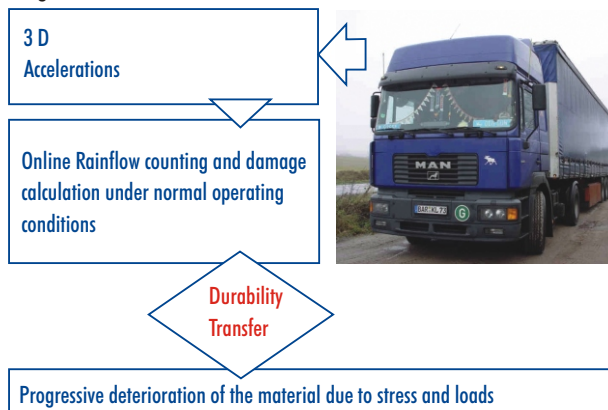
### Identification

Virtual channels are generated from the filtered acceleration data of the chassis. Reference measurements of test drives at defined driving conditions and routes serve for the identification of the *Durability Transfer* for the stress and cutting loads on the whole vehicle.



### Long-term Measurement

For long-term measurements only the survey of the accelerations and recording of the band pass filtered signals is necessary. Based on typical damage estimation methods the data is reduced online to a few kilobytes of data while still containing all relevant fatigue information.

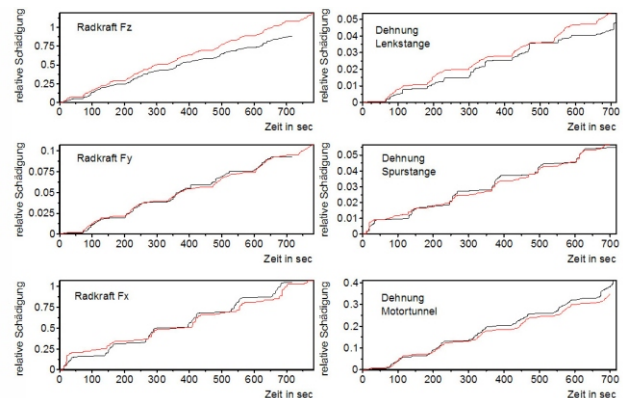


Subject to technical alterations  
(Rev. 1.0\_080605)

SWIFT GmbH is certified  
for aviation systems

### Determine the accumulated Damage

After the measurements the inverted *Durability Transfer* is used for calculating the damage evolution of the prior identified measuring values at the vehicle based on the reduced data.



### Application

The *Durability Transfer* Concept represents an inexpensive and reliable concept for recording the complex deterioration process at vehicles.

### Interesting Facts

The *Durability Transfer* Concept is highly innovative, especially through the combination of spectral analysis and Rainflow counting.

The *spectral analysis* is usually employed to obtain frequency related information of a loads spectrum.

The *Rainflow counting* is a widely established method for estimating material fatigue and residual life time with practically unlimited recording time.

The combination of these two methods offer the following advantages:

- Frequency correlated deterioration data
- Extremely high data reduction
- Unlimited measuring time
- Cost-efficient solution, especially in case of operating a whole fleet of vehicles



Gesellschaft für Messwerterfassungs-Systeme mbH

Am Dieburger Berg 18  
Tel. +49 (0) 6162 - 82 0 86  
Fax +49 (0) 6162 - 82 6 04

D-64354 Reinheim  
info@swift-online.de  
www.swift-online.de