



SCIENTIFIC-RESEARCH, EDUCATIONAL AND OTHER ACTIVITIES

Jiří Dvořáček

 **ústav
konstruování**

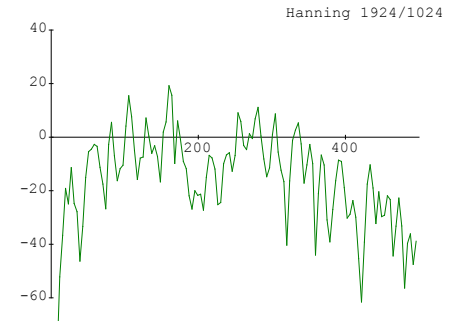
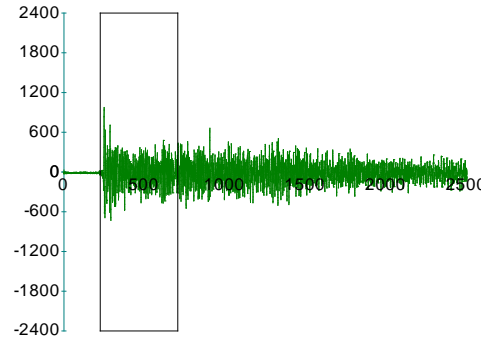
Institute of Machine and Industrial Design

Faculty of Mechanical Engineering

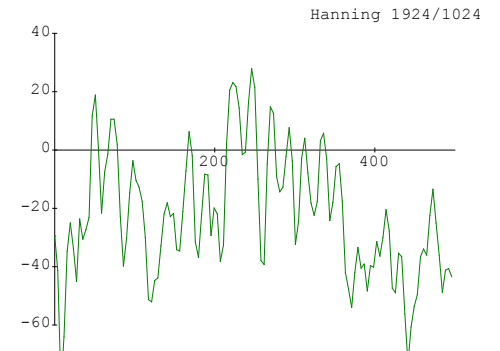
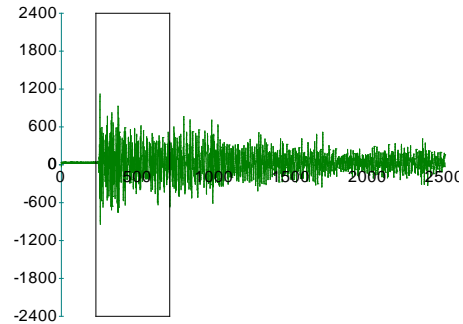
BUT

5.6.2013

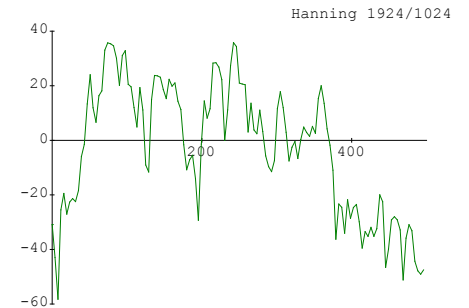
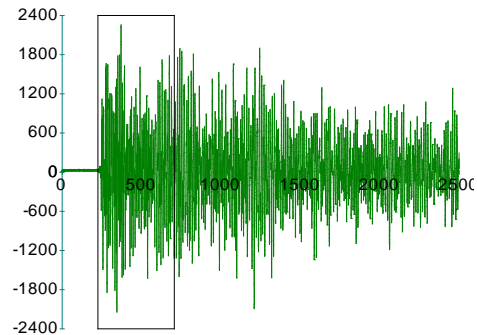
science and research



education



other activities



Dissertation title :

Development of a new generation of devices with advanced diagnostics to determine the contact degradation

Motivation:

Achieving global trend in modern diagnosis of contact fatigue

Main goal

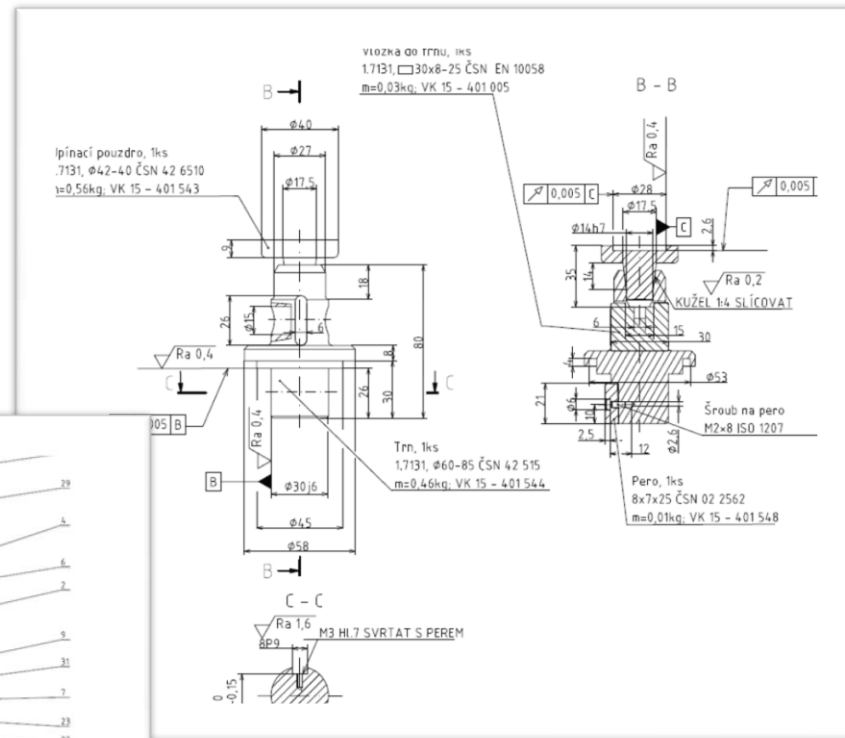
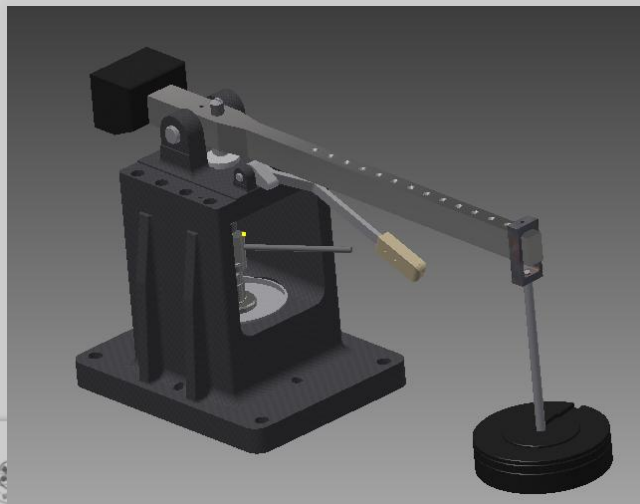
The methodology of detection and evaluation of AE signal, finding a correlation between changes in the parameters of the identified impairment test samples and bearings

Two areas:

Reconstruction of mechanical equipment

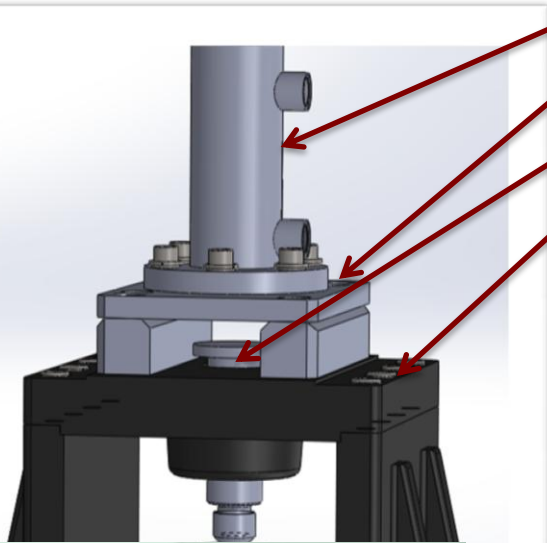
Research the possibility of using advanced diagnostics - a combination of vibration, acoustic emission, temperature.

Measuring stand-original version

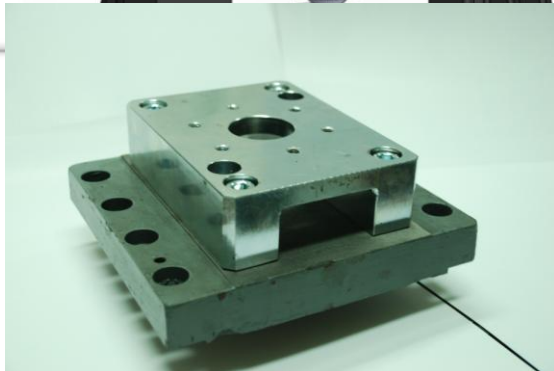


complete drawings

Measuring stand

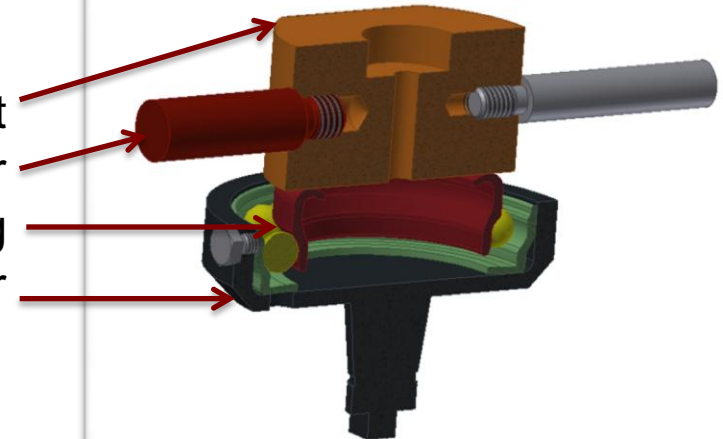


Hydraulic cylinder
Holder cylinder
Load cylinder
The base frame



pressing
vibration
axial
bearing

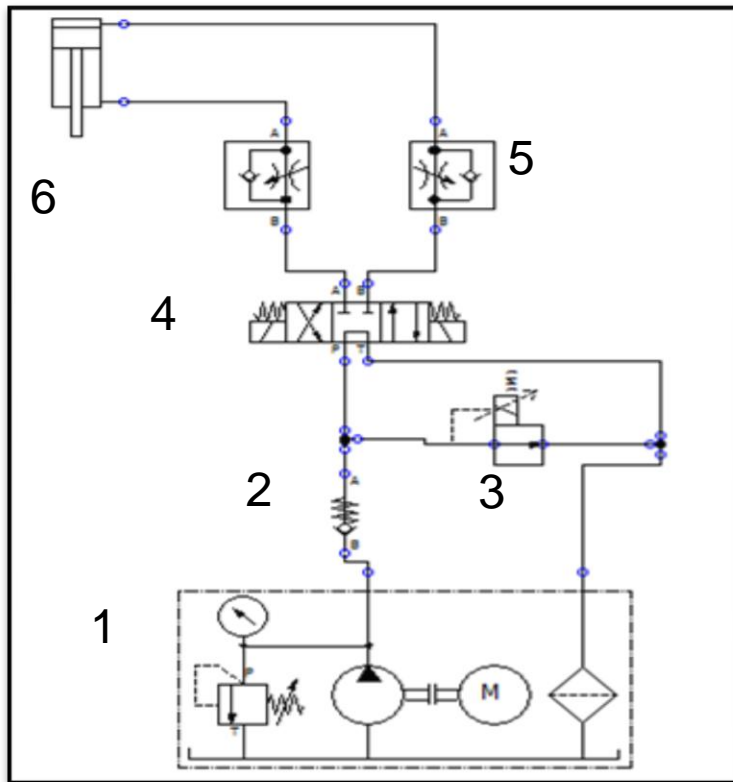
element
sensor
bearing
retainer



test node



Hydraulic system load



- The pressure required to achieve the strength 5kN is 3.97 MPa at 40 mm diameter piston
- Pressure respectively. power piston operated, proportional pressure valve
- The movement of trains operated hydraulic distributor

- Advantages - possibility of using the unit SA3, high efficiency, accuracy, lower operating costs
- Disadvantages - higher acquisition costs, a medium sensitive to contaminants, temperature

Model-MATLAB-SIMULINK /Gergel M. DP/.

- | | |
|------------------|---------------------------------|
| 1-hydraulic unit | 4-hydraulic control distributor |
| 2-one-way valve | 5-throttle valve |
| 3-pressure valve | 6-hydraulic cylinder |

Evaluation units



Continuous data storage PC
USB interface
evaluation program DaeShow
Export data in text and binary - use Matlab

System IPL - AE parameters

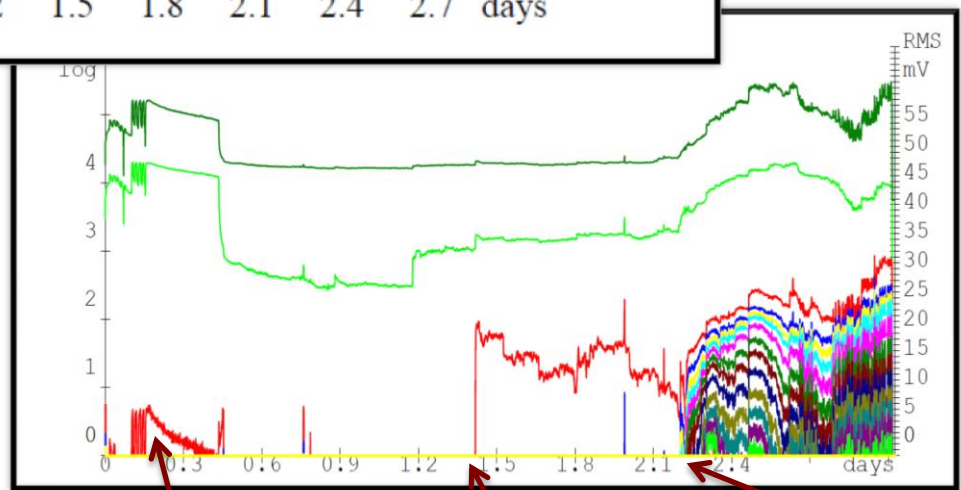
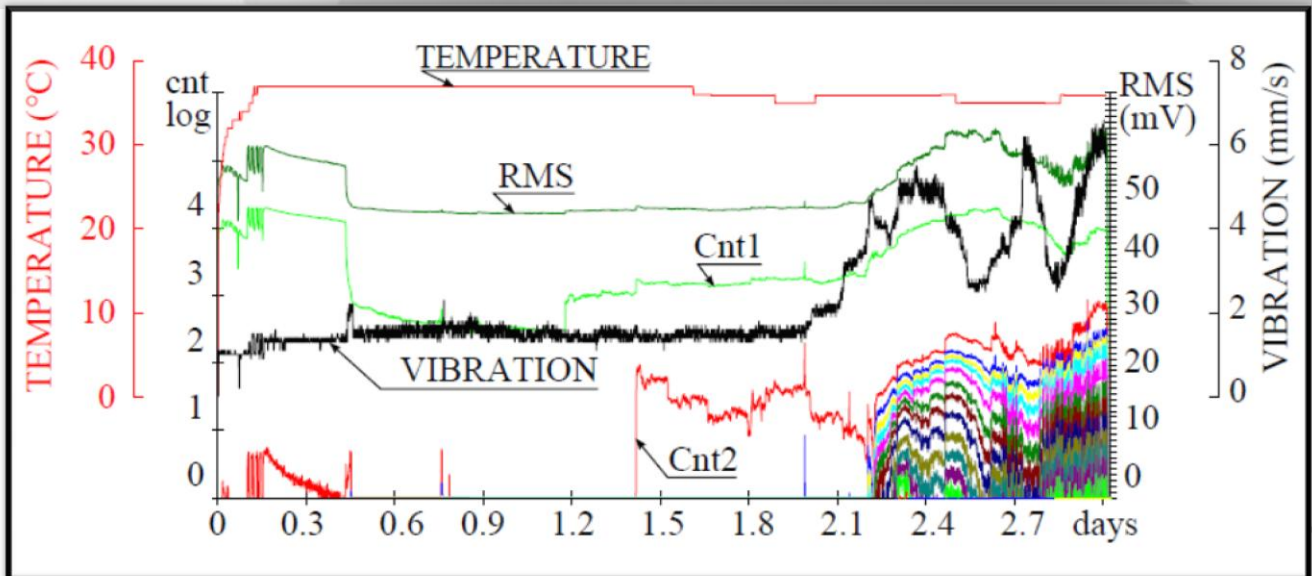
Viditech 2000

powerfull set of vibrodiagnostic instruments

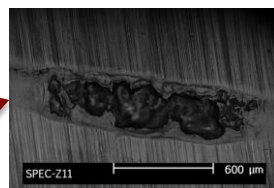


<http://www.viditech.cz/2000cv/overview/>

Results

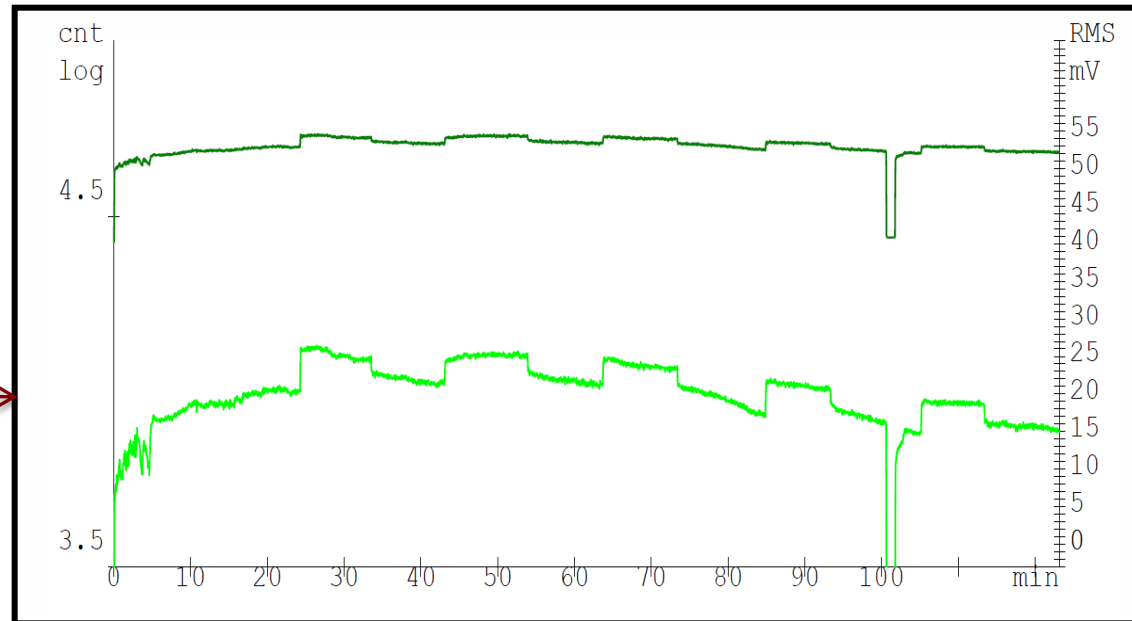
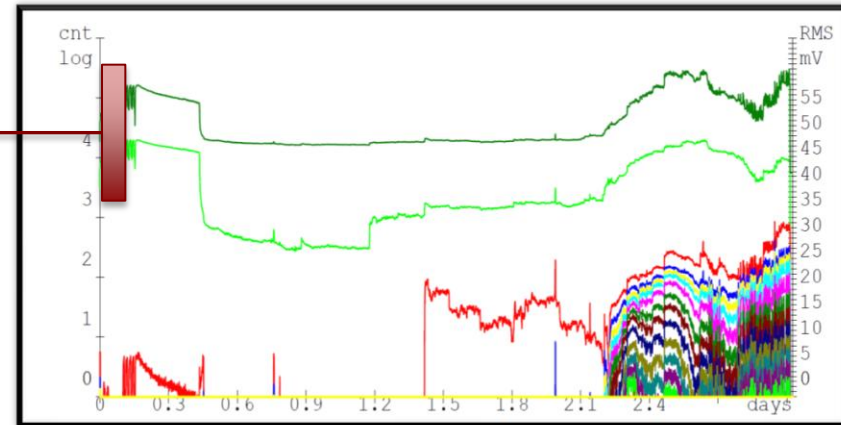
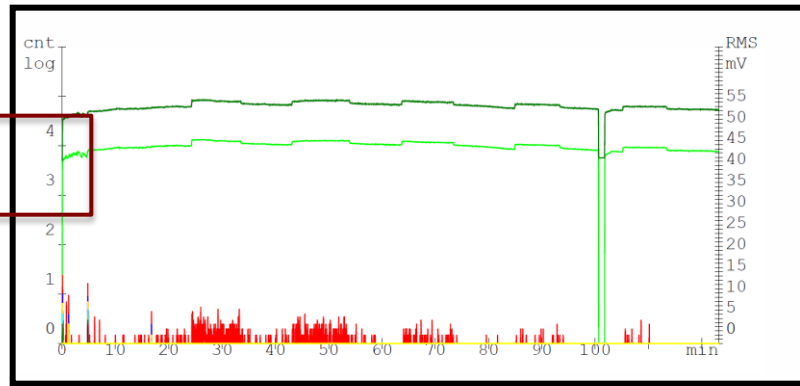


Test parameters:
 sample 100Cr6
 $\sigma_{hertz} = 5000\text{MPa}$
 lubricant – Mogul LV2-3



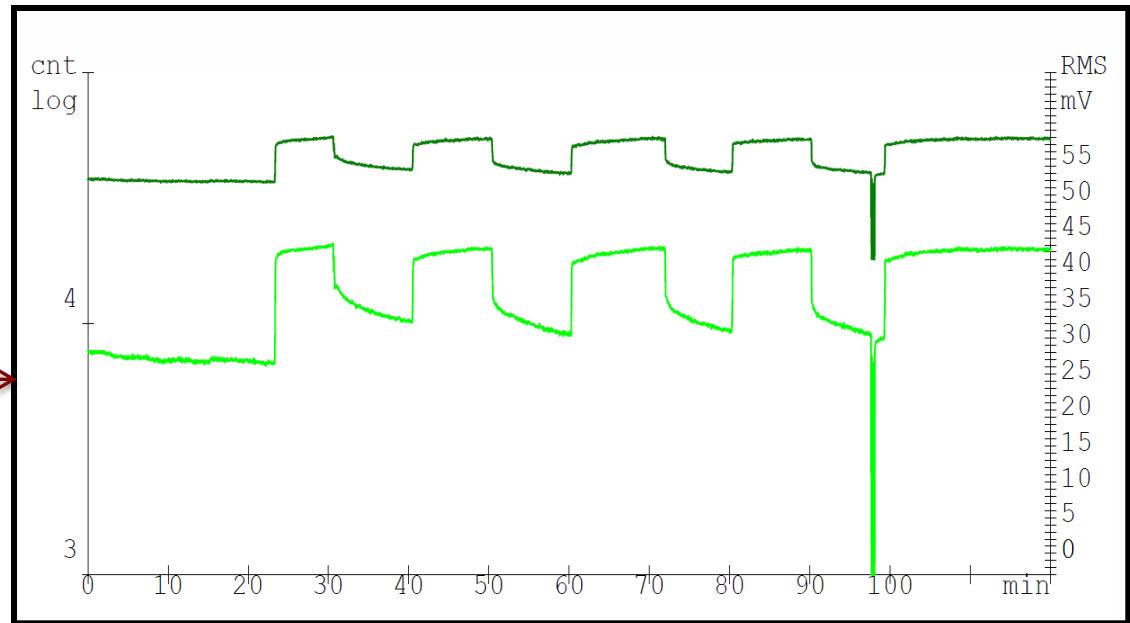
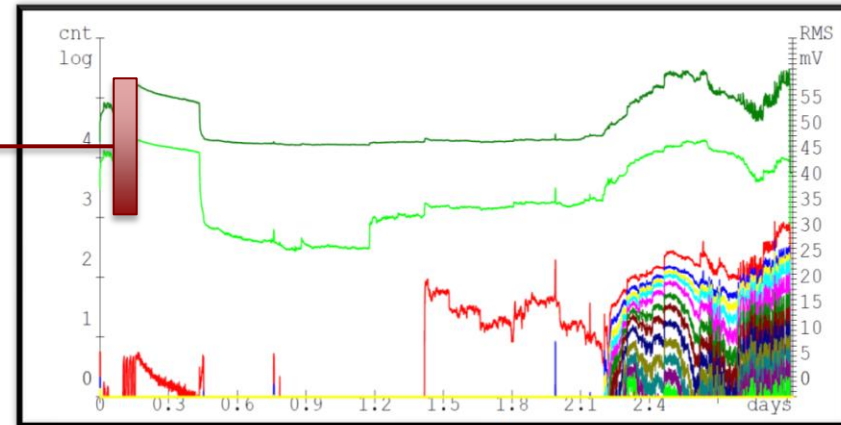
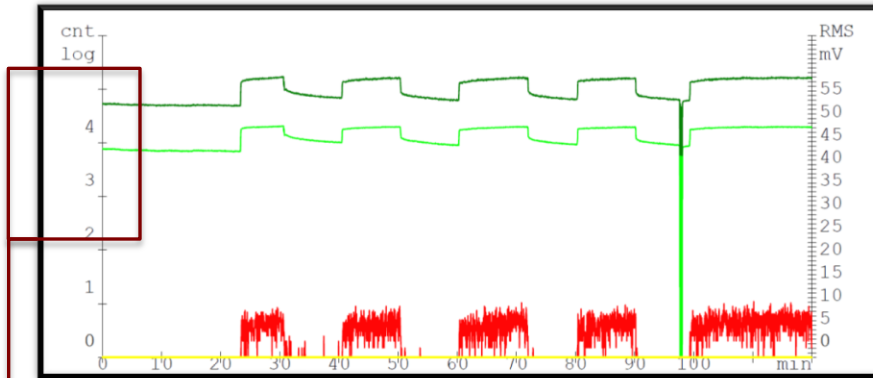
spalling

- Running-in stage
- Pitting initiation and propagation
- Spalling



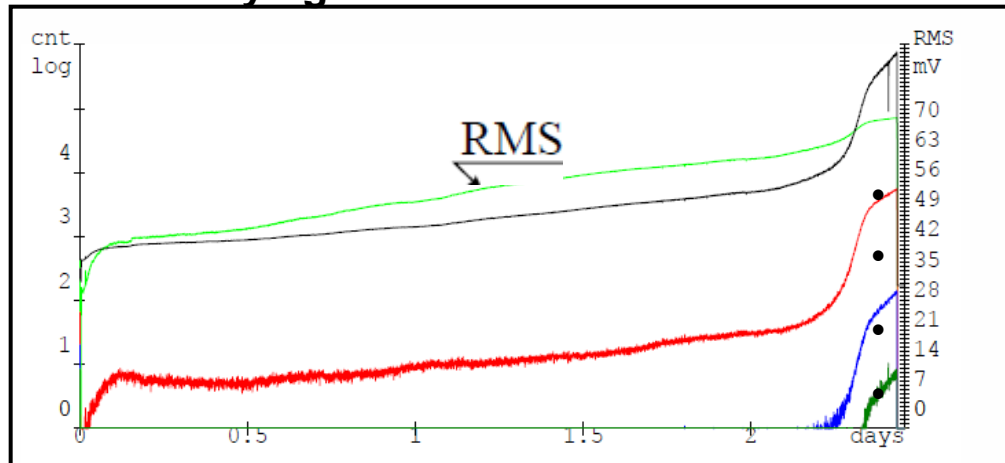
$\sigma_{\text{Hertz}} = 4500/4000 \text{ Mpa}$
per 10 minutes

Results



σ Hertz = 5000/4000 Mpa
per 10 minutes

Verifying influence additives on the contact fatigue of materials

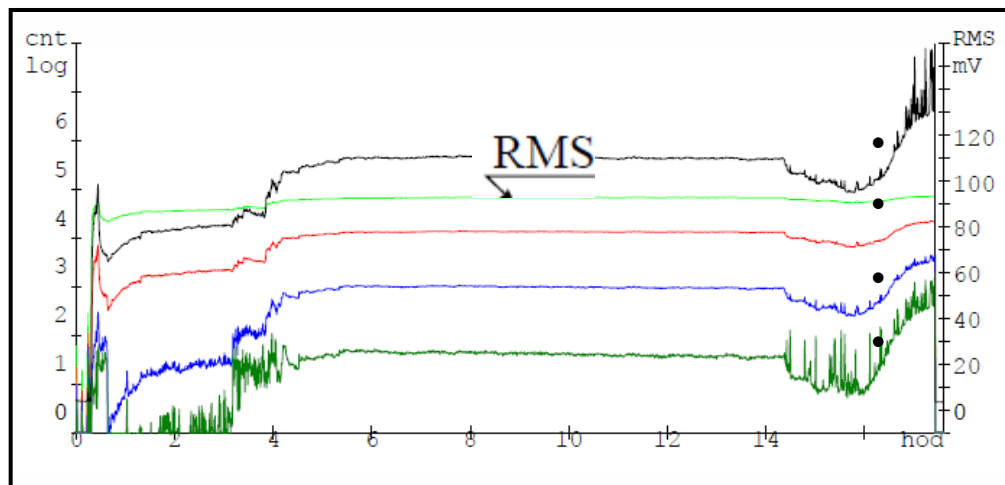


Test parameters:

sample St50-2

$\sigma_{\text{Hertz}} = 3000\text{MPa}$

lubricant – Mogul LV2-3



Test parameters:

sample St50-2

$\sigma_{\text{Hertz}} = 3000\text{MPa}$

lubricant – Mogul LV2-3+F15

Conclusions

Created an experimental basis for the further development of research in the area of contact fatigue.

Proved the importance of AE applications for detailed analysis of the effects of varying the load and the influence of selected additives to lubricants to contact fatigue.

The results of the work are linked to other already solved DP and announced a new thesis topic.

The possibility of using signal processing methods for upcoming projects and expansion of cooperation with industry

Deadlines DDP

Modifying station	2-5/2013
Verification tests	3-6/2013
Text work	-continue
Submission of work	-7/2013

Publication:

MAZAL, P.; PAZDERA, L.; DVOŘÁČEK, J. **Application of acoustic emission method in contact damage identification. *INTERNATIONAL JOURNAL OF MATERIALS &***

PRODUCT TECHNOLOGY. 2011. 41(1). p. 140 - 152. ISSN\~0268-1900.

SVOBODA, P.; BRANDEJS, J.; DVOŘÁČEK, J.; PROKEŠ, F. **Základy konstruování** , *učebnice*,2011, ISBN978-80-7204-750-5

Insight GB – (IF) – Bearings diagnostics with help of AE - v procesu přípravy

Education

management of e-learning system for following subjects :

1. a 2. years of BS a MS
1. year KS

Projekty 2013

FR-TI4/247 - Research and development of design and technology of energy-efficient spherical roller bearings with brass cage (2012-2015, MPO/FR) Doc. Chladil ÚST OTO, ZKL- výzkum a vývoj, ZKL a.s.

HS 2013

1.Creating a 3D model and 2D drawing engine block workpiece in the research and development of production technology of casting
MKS Autodíly a.s./Paloušek,Koutný, Koutecký, Zatočilová/

2.Verifying influence additives METABOND on the contact fatigue of materials /Nohál/
Metanova a.s.

3.Analysis of the accident bearings 6303,
Magneton a.s.,Kroměříž /Mazal/



Collaboration :
Poličské strojírnny a.s.

Projekt TAČR - Research and development of mobile diagnostic apparatus based on acoustic emission for the detection and prediction of damage to pneumatic systems, PS a.s., Dakel Rpety – update 2013

HS in preparation- **Diploma thesis - construction Coriolis flowmeter**
St. 4r. M. Krejčí, Doc. Beneš ÚAMT FEKT

Thank you for your attention