1.SERVIS-ENERGO, s.r.o.

Tylova 57 a

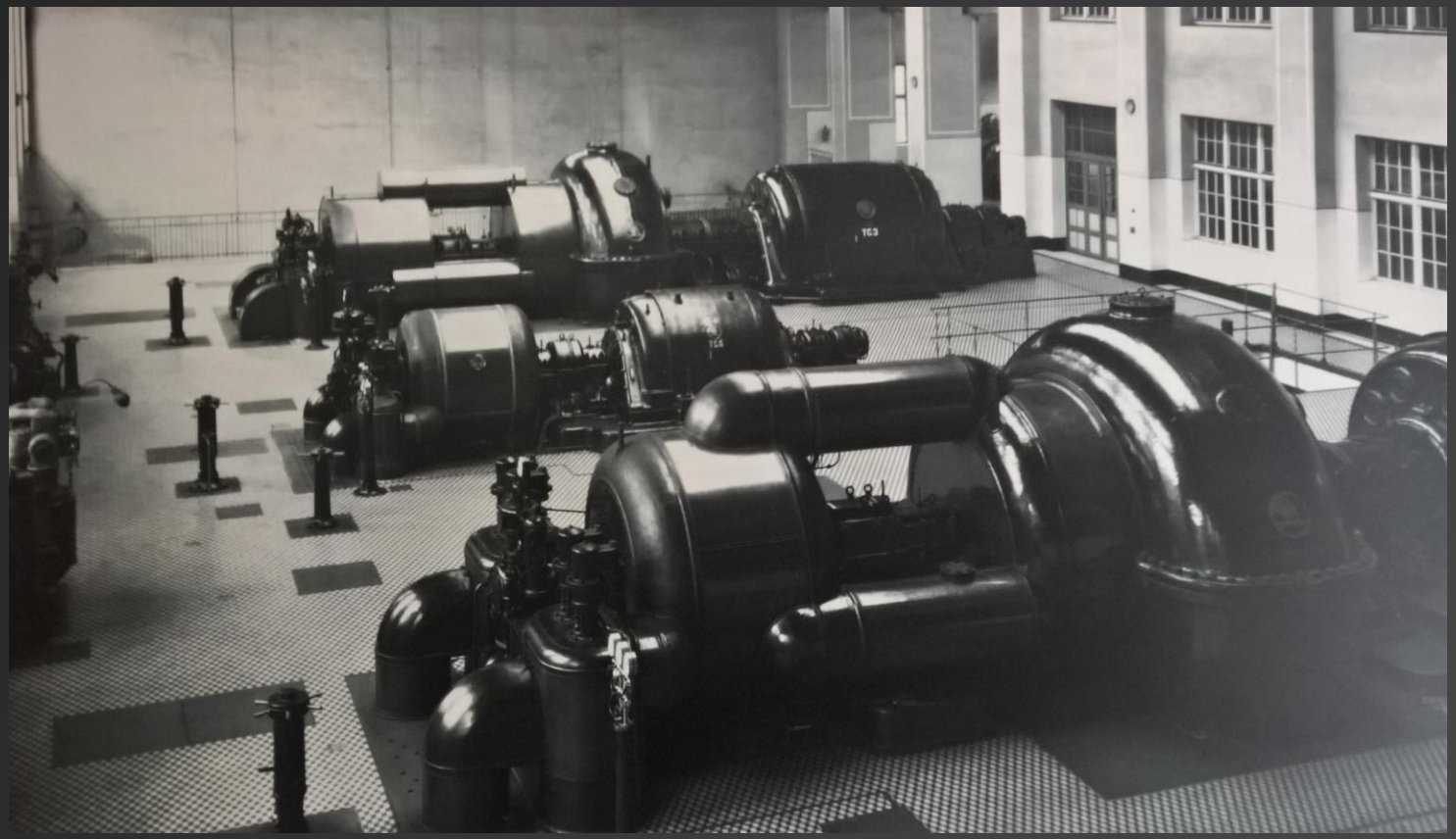
Plzeň

General information

- date of establishment: 5. 1. 1994
- head office: Hřbitovní ul. (until 2007)

Change location of head office (2007)

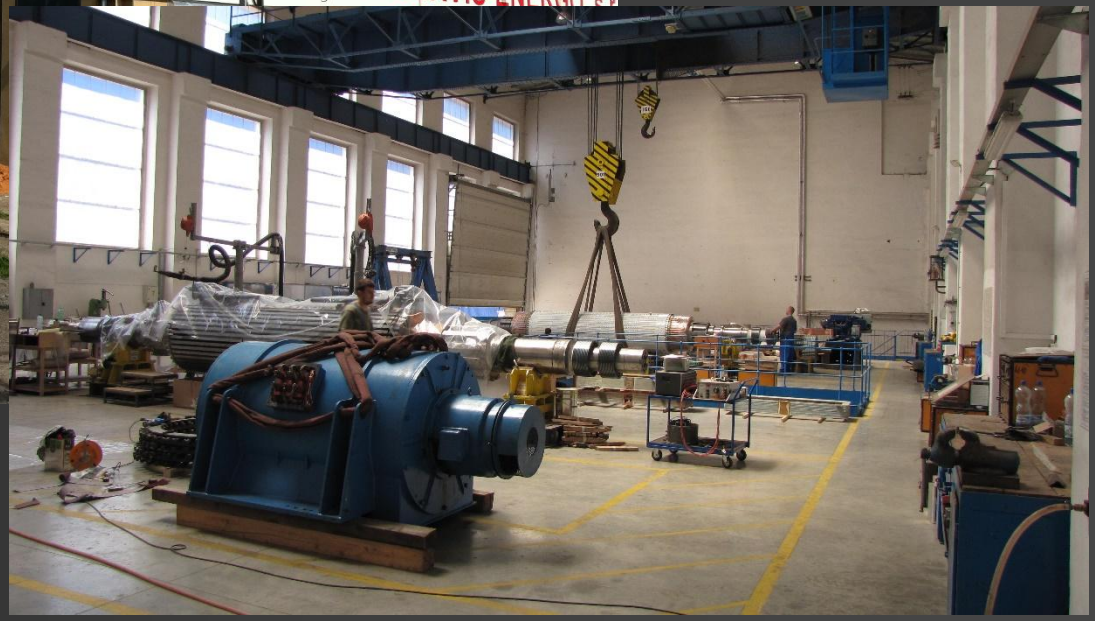
ELÚ I = first powerplant of Škoda company



Change location of head office (2007)

condition of the building before renovation

2011 – renew of building

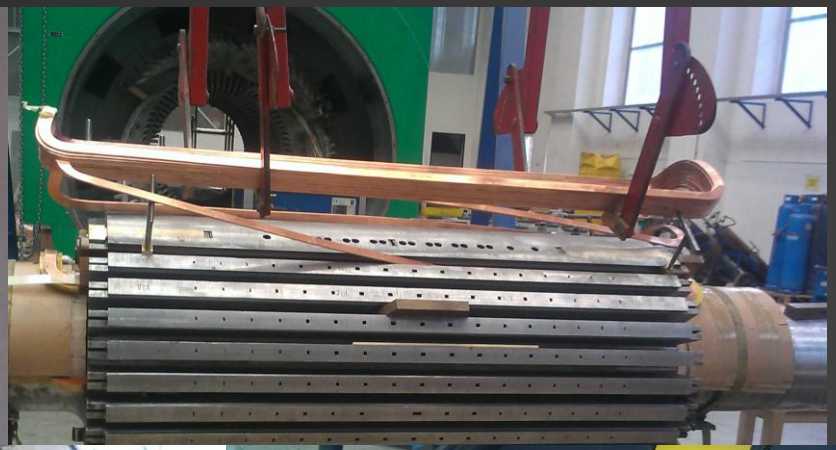


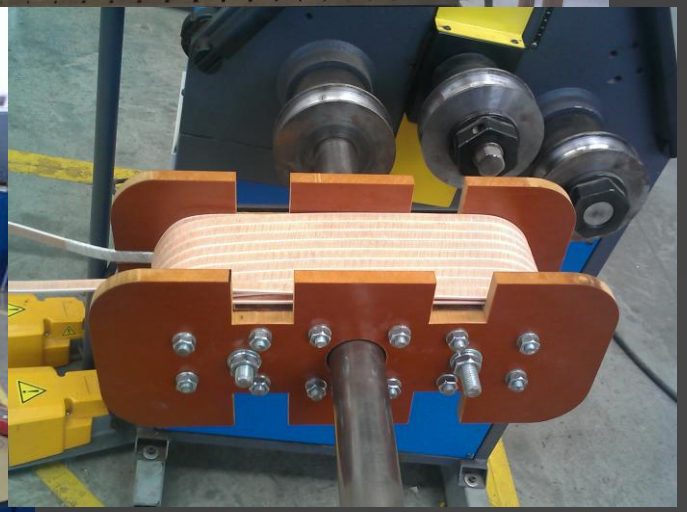
Overview of activities

- service on-site

- instalation of generators
- turbo and hydro generator repairs
- design and manufacture of generator accessories
- diagnostics and consulting for electrical machines (HV)
  - studies, relabeling, maintenance program

Rotor overhaul, component manufacturing in the workshop





Certification

- certification:
  - ISO 9001 (since 2002)
  - ISO 14001, ISO 45001 (since 2005)
- inspection and testing of designated gas and pressure equipment
- approved supplier to ČEZ (2011, 2024)
- AZVN – HV laboratory E-37 (since 2014)
- authorization for activities in ČEZ atomic powerplants (since 2017)
- IO (inspection authority) for ČEZ – diagnostics of rotating machines (2023)

Major customers (ČR, SR)

- ČEZ, Sev.en, Slovenské elektrárne,
- VEOLIA, EOP, Vodohospodárska výstavba
- Doosan, G-Team, AJV
- ES Košice, MH Teplárenský holding
- ČEZ Energoservis, EKOL, Slovnaft
- townplants
- service contracts

Major contracts - TG

objednatel	stavba (výkon)	předmět zakázky	realizace
ČEZ	Dukovany	design and delivery of oil seal kits	2016
G-Team	Chvaletice (200 MW)	refurbishment of two machines	2017
Sev.en	Chvaletice (200 MW)	rotor refurbishment	2018
ČEZ	Počerady (220 MW)	rotor refurbishment	2019
Sev.en	Chvaletice (200 MW)	refurbishment of two blocks	2021
Sev.en	Počerady (220 MW)	bearing replacement	2022
EOP T.H.	Opatovice (55 MW) Žilina (32 MW)	rewinding + delivery of new winding bars	2023
SE; ČEZ	Mochovce, Bohunice; Dukovany	service works	2025

disassembly, diagnostics, repair, cleaning, supply of windings/insulation/components, assembly, diagnostics

Major contracts - HG

	site (výkon)	předmět zakázky	real.
ČEZ	Kamýk (10 MW)	new rotor and stator HG	2014
ČEZ	Dlouhé Stráně (330 MW)	damper repair	2017
ČEZ	Lipno I (64 MW)	new HG stator	2017
ČEZ	Dlouhé Stráně (330 MW)	renovation of 2 poles and coils	2018
ČEZ	Štěchovice II (53 MW)	new rotor coils and damper connections	2021
Litostroj	Nechranice TG1, 2 (5 MW)	repair and cleaning	2021
ČEZ	Kamýk TG3 (12 MW)	generator alignment	2022
ENERGO PRO	MVE Kadaň	rotor rewinding	2022
ČEZ	Dalešice (110 MW)	design & replacement of dampers (4 blocks)	2023-4
ČEZ	Dlouhé Stráně (330 MW)	rewinding of the stator (2 machines)	2024-5

Studies

- 2014 HG overload capacity, Vrané
- 2014 HG parameter recalculation, Kamýk
- 2016 MVE Hracholusky relabeling
- 2015 HG Lipno I recalculation
- 2016 EDS shock absorber adjustment option
- 2018 HG Lipno II calculation and design
- 2019 calculation of efficiency Komořany
- 2019 asynchrounous start-up of synchronous machine (EDA)
- 2020 increase in performance and relabeling EMO 12
- 2021 methodology for monitoring tension bolts (tension washers)
- 2023 Čierný Váh – causes of warming and repair design

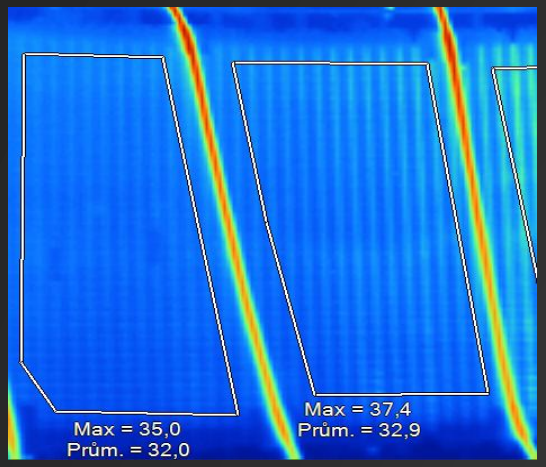
Diagnostics of electrical machines

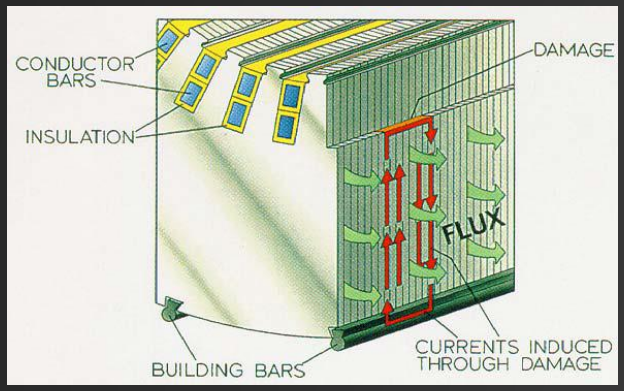
- insulation resistence (DAR, PI, DD)
- flux core test (classic or ELCID)
- step voltage (SV)
- high voltage tests
- surge tests (RSO)
- loss factor and partial discharge (50 Hz and VLF – 0,1 Hz)

Diagnostics of electrical machines

- checking inter-thread short circuits during machine operation (fluxprobe)
- vibration and operational balancing
- measuring the flow of operating fluids
- thermal imaging
- checking electrical machine sensors

flux test of magnetic core





- classic
  - HV source
  - HV cable connection
  - thermal imaging
- ELCID
  - developed by IRIS Power
  - 4% saturation acc to classic
  - power supply 230 V 16 A
  - sensitivity

high voltage & leakage tests

- DC test equipment
  - up to 150 kV
- AC test equipment (50 Hz)
  - up to 10 kV
- very low frequency
  - 0,1 Hz – up to 35 kV
- high frequency
  - 500 Hz; 2000 Hz
- special resources
  - AC 50 Hz, 2500 A (thermal imaging of damper winding)
  - DC 4500 A (for heating)

Measurement of tg δ and partial discharges

- using the mentioned HV sources
- loss factor measurement
- particle discharge
  - matrix
  - ignition voltage

Checking for inter-thread short circuits

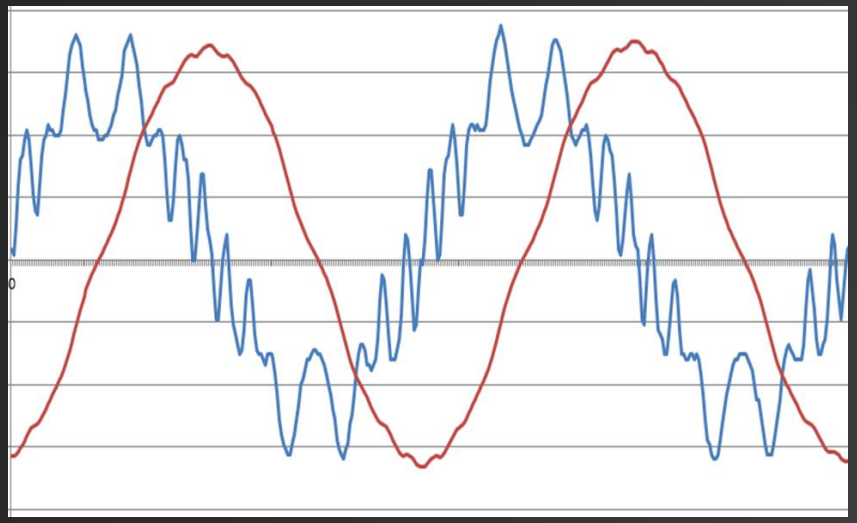
- off-line methods
  - voltage drop measurement
  - electromagnetic probe test
  - surge test (RSO)
- on-line methods
  - checking rotor state using flux probe test
    - turbogenerators
    - hydrogenerators

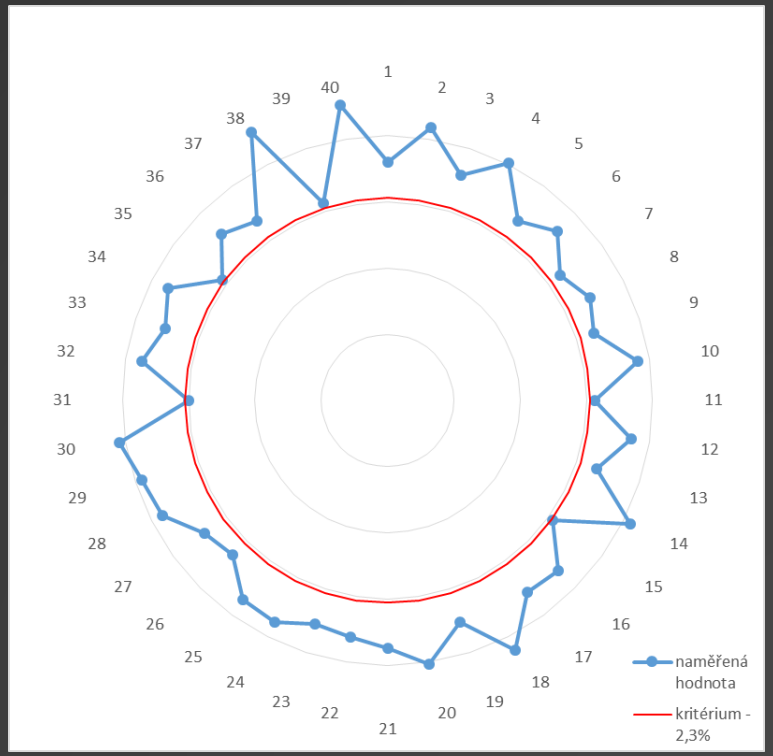
Flux probe test

- installation of the probe into the stator

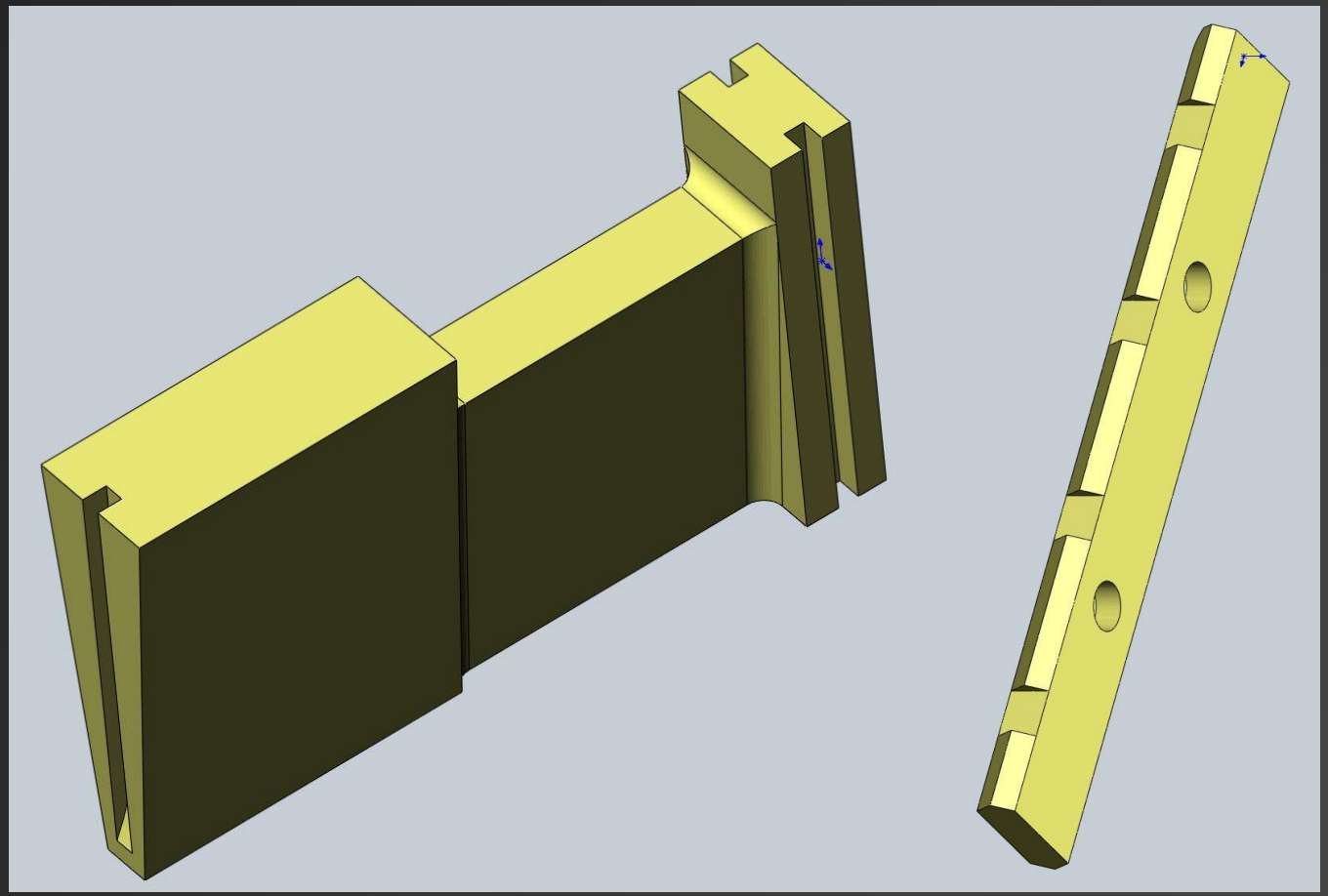
Flux probe test

- example of evaluation

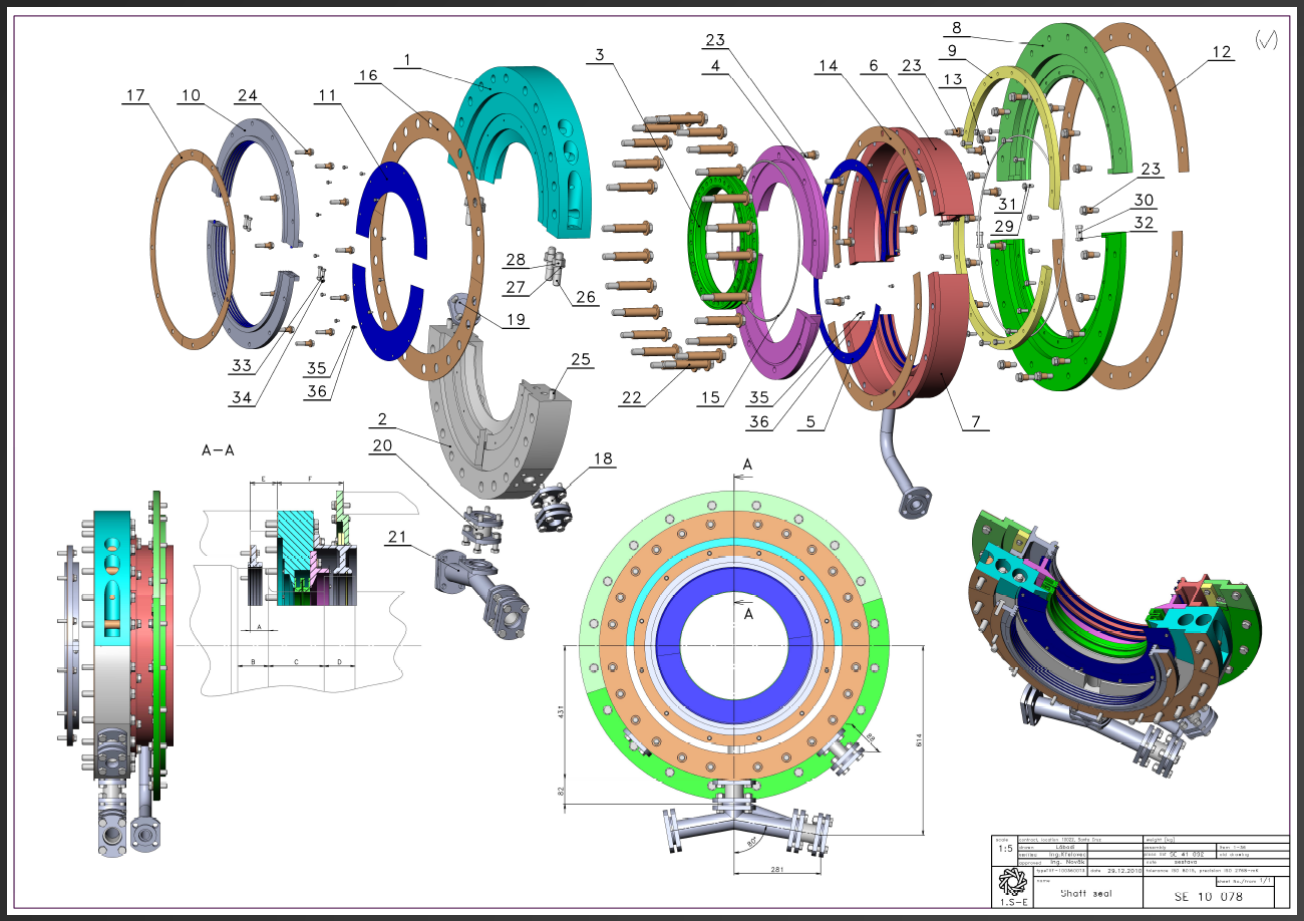




Design - insulating components

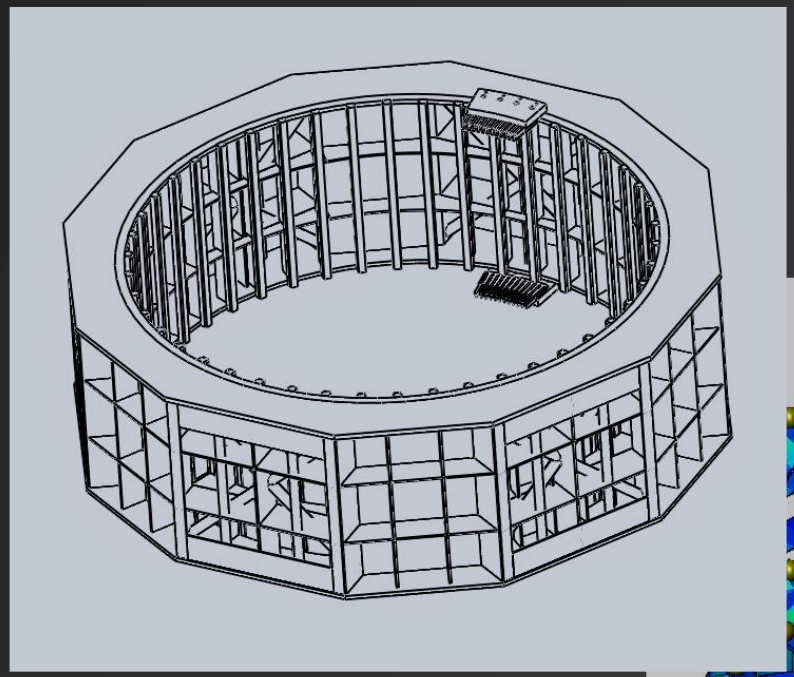


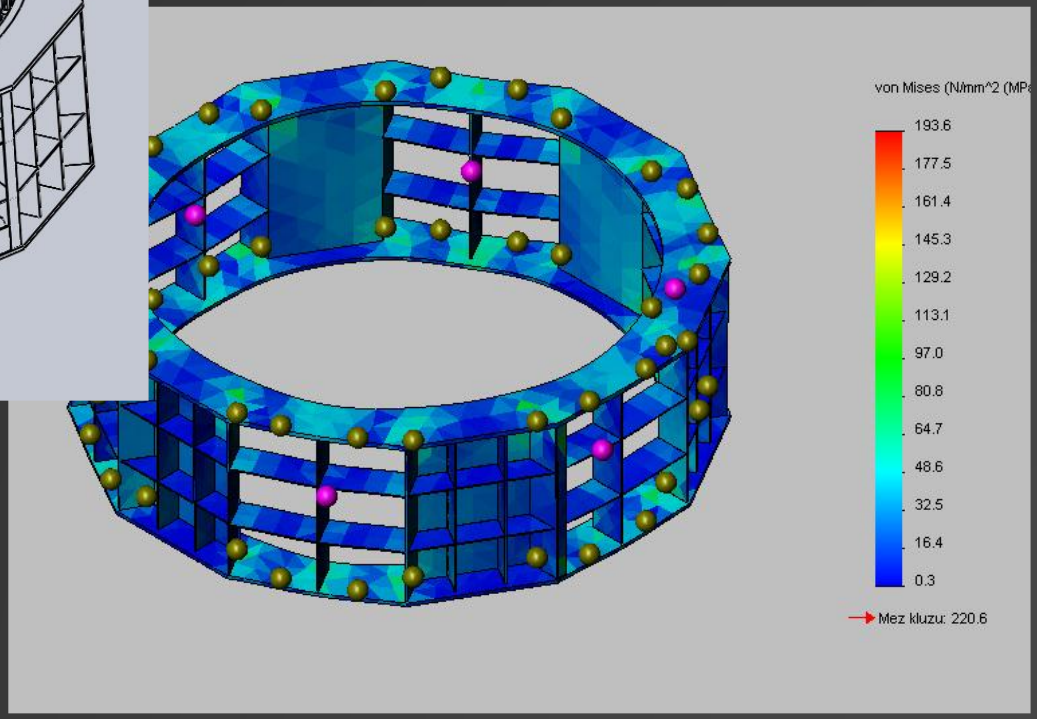
Replacement of original axial sealing



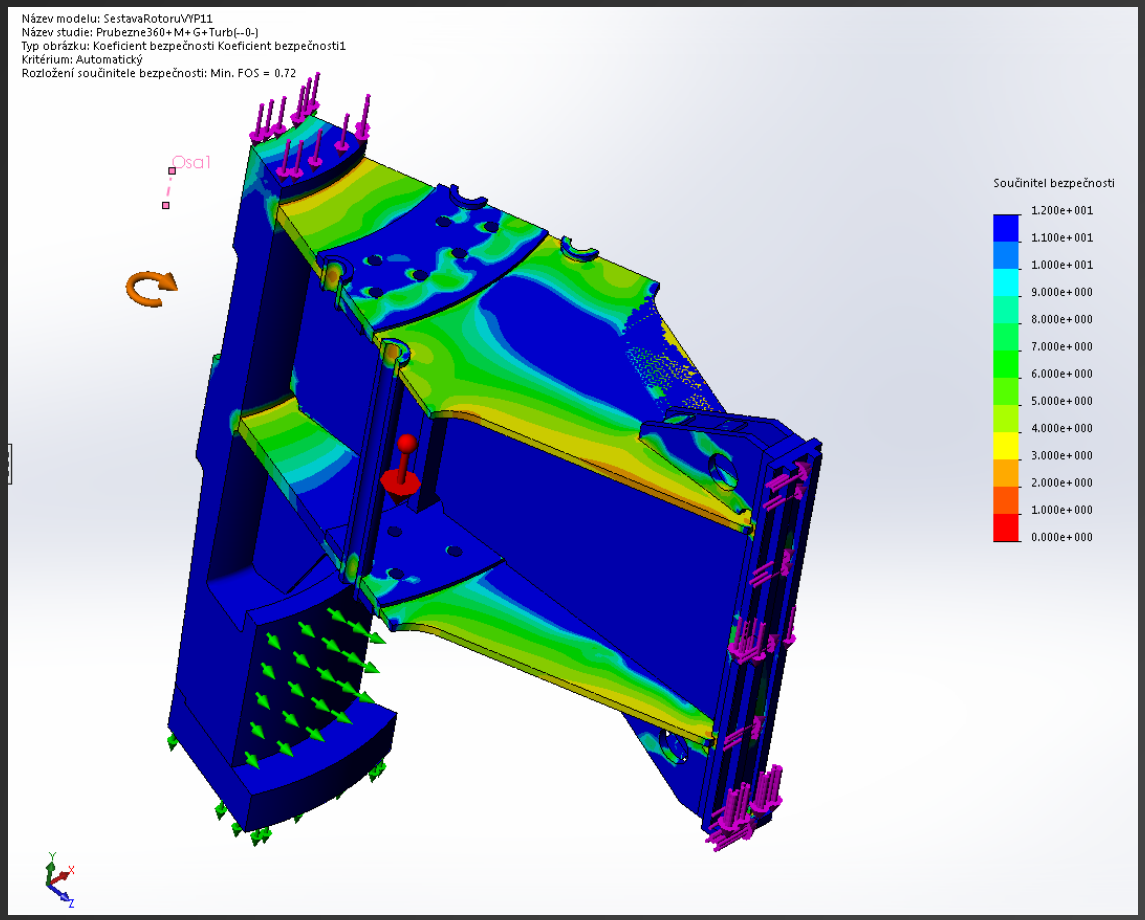
Design – new oil kit

Design of new stator frame



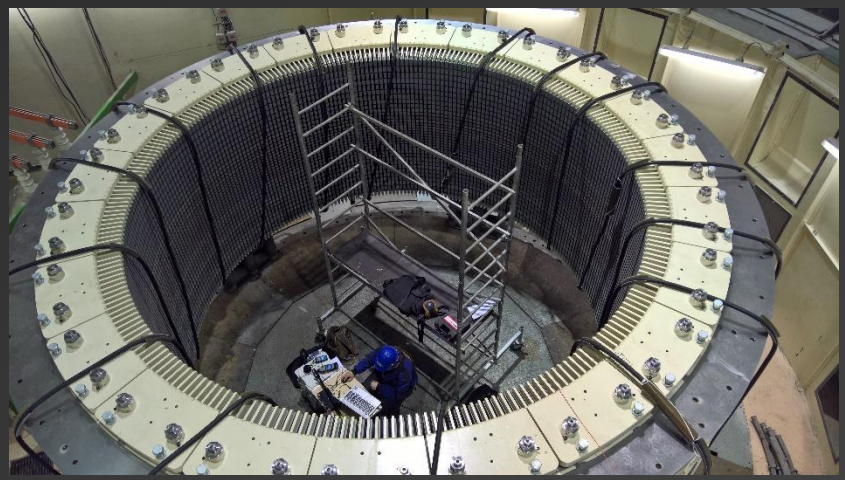


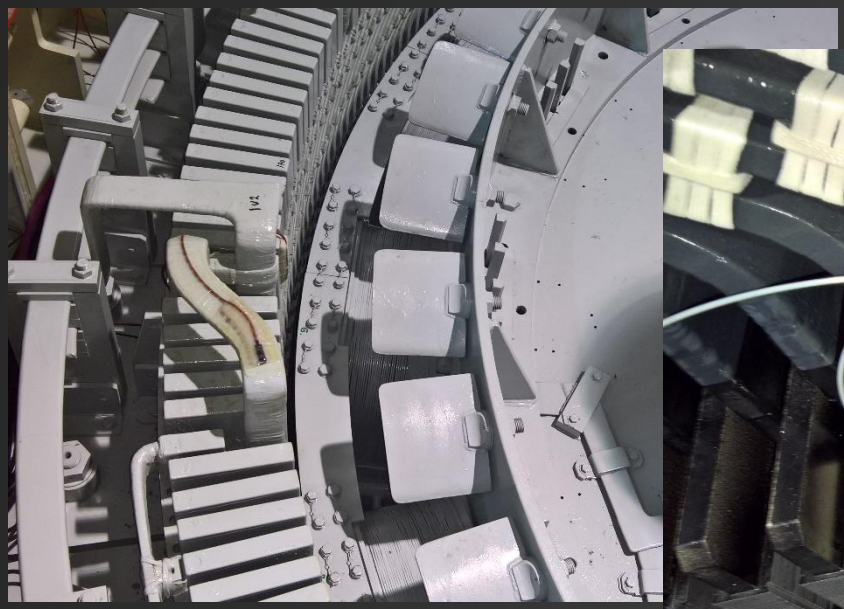
Design of new rotor

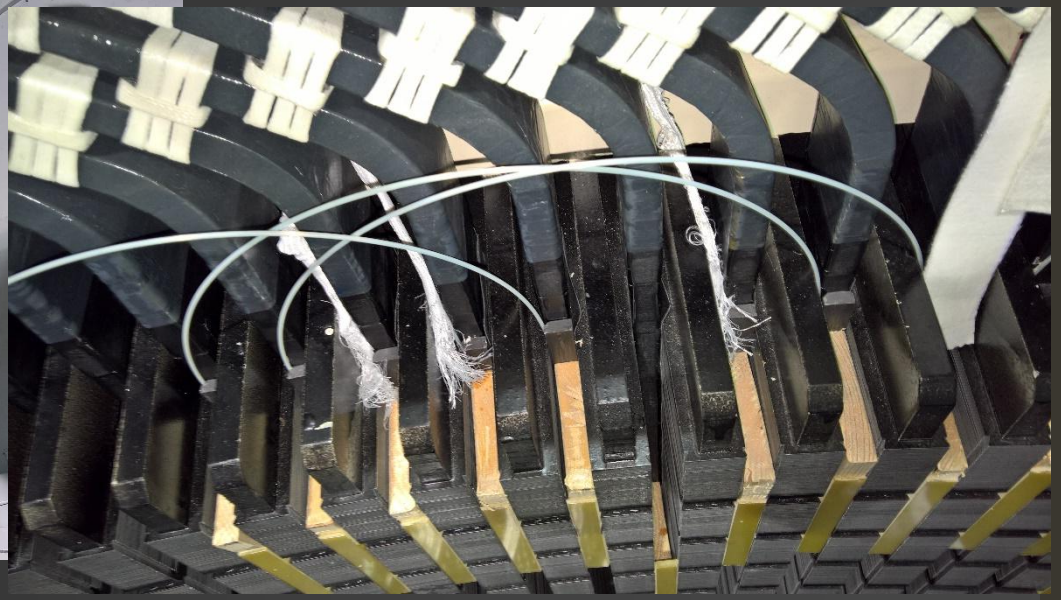


Lipno TG1 (2017)

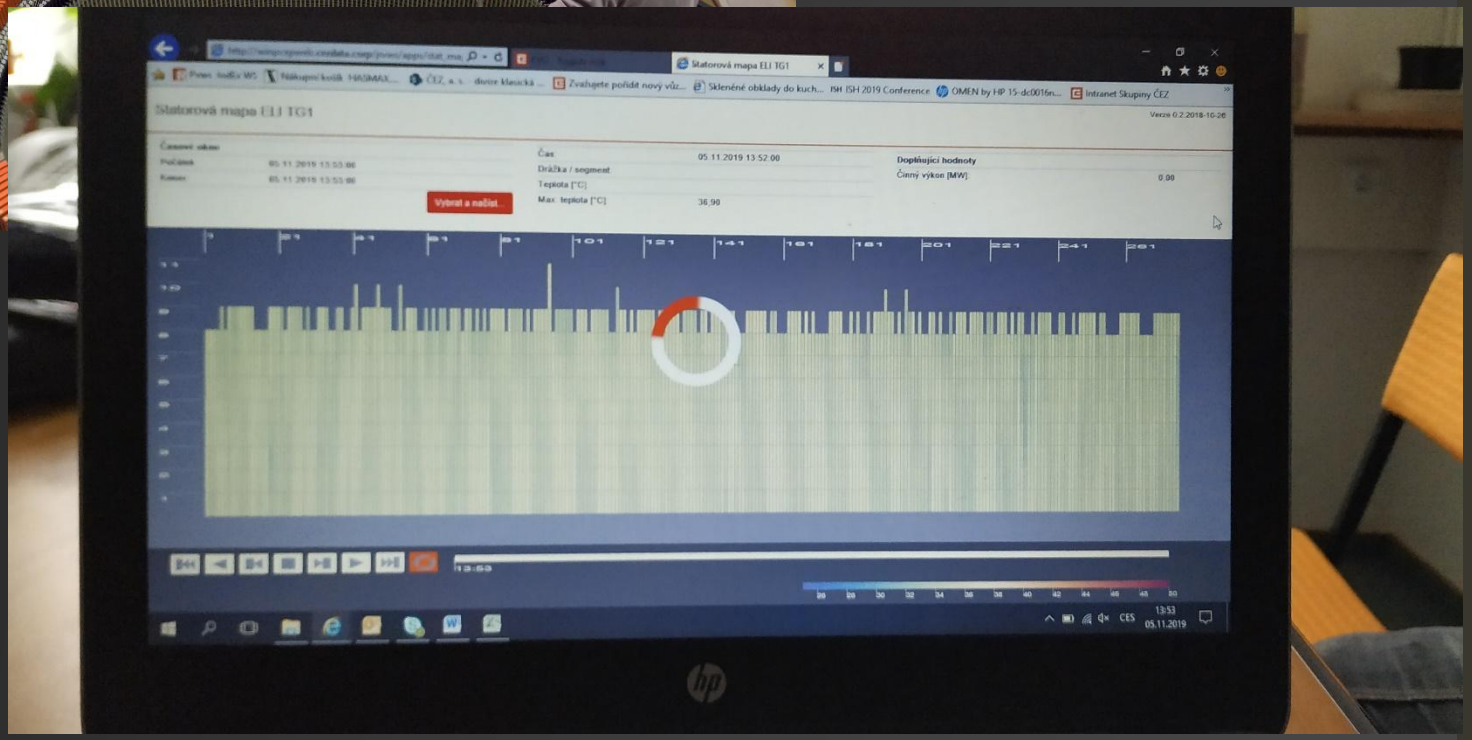
new reinforced frame
strain gauge pods
measurement of winding end face vibrations
temperature measurement using optical fiber (approx. 2300 measuring points)







Lipno TG1 (2017)



- installation of new generators
- servicing of turbo and hydro generators, high-voltage motors
- design and manufacture of generator accessories
- diagnostics and consulting for electrical machines (high voltage)
- design and technological preparation
- diagnostics of high-voltage machines
- studies (efficiency, operating parameters)

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