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Equipment condition evaluation based on online monitoring of vibrations and temperatures

Jan Molnar

AVEVA

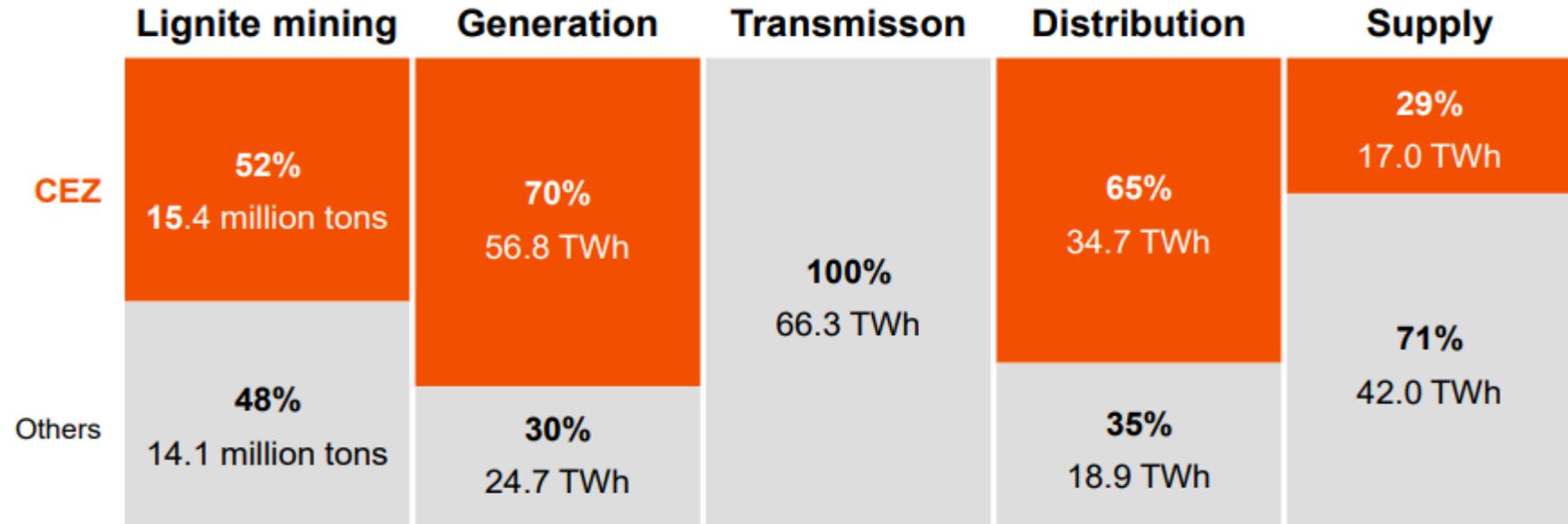
Content of presentation

Chapters

- I. About company ČEZ a.s.
- II. Introduction into the vibrations
- III. Work in PI System
- IV. Summary of results
- V. Future vision

Chapter I. - About ČEZ

ČEZ GROUP IS THE MOST IMPORTANT ENERGY COMPANY IN ITS DOMESTIC MARKET AND GROWING PRESENCE IN WESTERN EUROPE



- CEZ fully owns the largest Czech mining company (SD) covering 65% of CEZ' s Lignite needs of 16.8m tons
- Remaining 3 coal mining companies are privately owned

- Other competitors are individual IPPs

- The Czech transmission grid is owned and operated by CEPS, 100% owned by the Czech state



- Other competitors – E.ON, PRE (41% held by EnBW), Bohemia Energy, Innogy, Centropol Energy

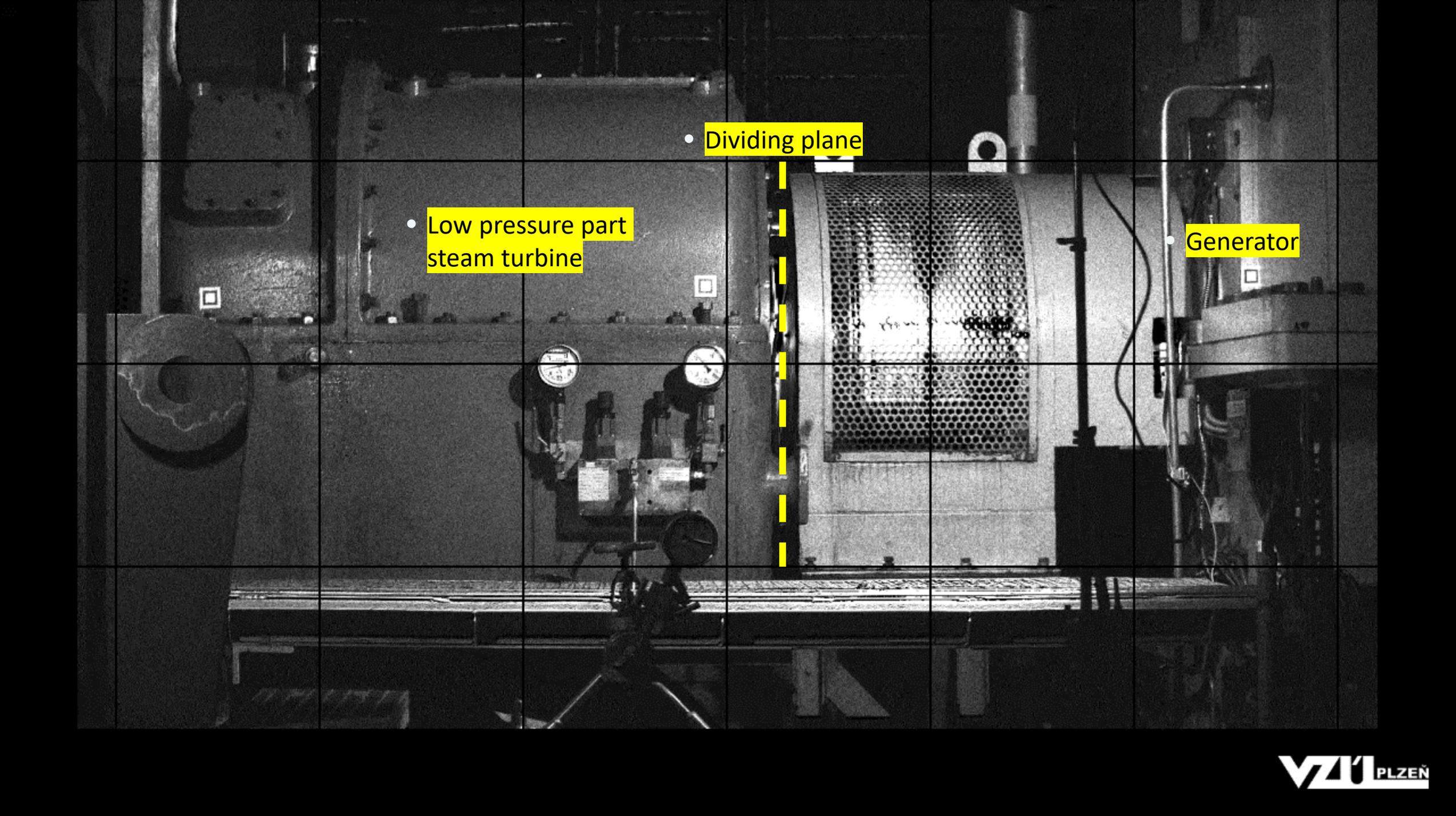
Chvění či kmitání (oscillace, jest pohyb opakující se stále v určitých dobách kolem dané polohy. Vychýlení př. strunu upevněnou na obou koncích polohy, vrací se do ní s rychlostí stále rostoucí, přejde přes rovnovážnou polohu a pohybuje se dále s rychlostí stále ubývajících, až se zastaví. Načež týž pohyb koná ve směru protíném; pohyb tento tam a zpátky kolem původní polohy pořád se opakuje. Jiným příkladem jest pružné péro stočené do spirály, obtěžkané závažím (obr. č. 1941.). Prodloužíme-li a pustíme-li je, počne se zkracovati, zkrátí se přes původní délku a zase se prodlouží, tak že jednotlivé částice kolem své rovnovážné polohy se pohybují. **Ch.** nastává, je-li těleso nebo jednotlivé jeho části puženo nějakou silou, nejčastěji pružností, do určité polohy a přivedeme-li je z této nějakým způsobem. Dle směru pohybu částic jest buď příčné (transverzálné), nebo podélné (longitudinální), nebo otáčivé. S **ch.** podobné jest kývání. Nejjednodušší případ **ch.** jest, když síla pužící částici do rovnovážné polohy jest úměrná výchylce z ní, což u pružnosti jest pokud vzdálenost ta není větší než mez pružnosti a u kyvadla, dokud úhel výchylky jest tak malý, že místo sinu úhlu lze vzítí úhly; tudíž i zrychlení způsobené jest této výchylce úměrné. Pohyb takový nazýváme jednoduchým pohybem harmonickým. Myslme si bod O (

Chapter II. - Vibration

Technical Description:

Vibration is a periodic back-and-forth motion of the particles of an elastic body or medium, commonly resulting when almost any physical system is displaced from its equilibrium condition and allowed to respond to the forces that tend to restore equilibrium.

- shivering
 - trembling
 - shaking
 - oscillation
- + Useful (in medicine, in compaction)
- Damaging (earthquake, harmful mechanical vibrations)

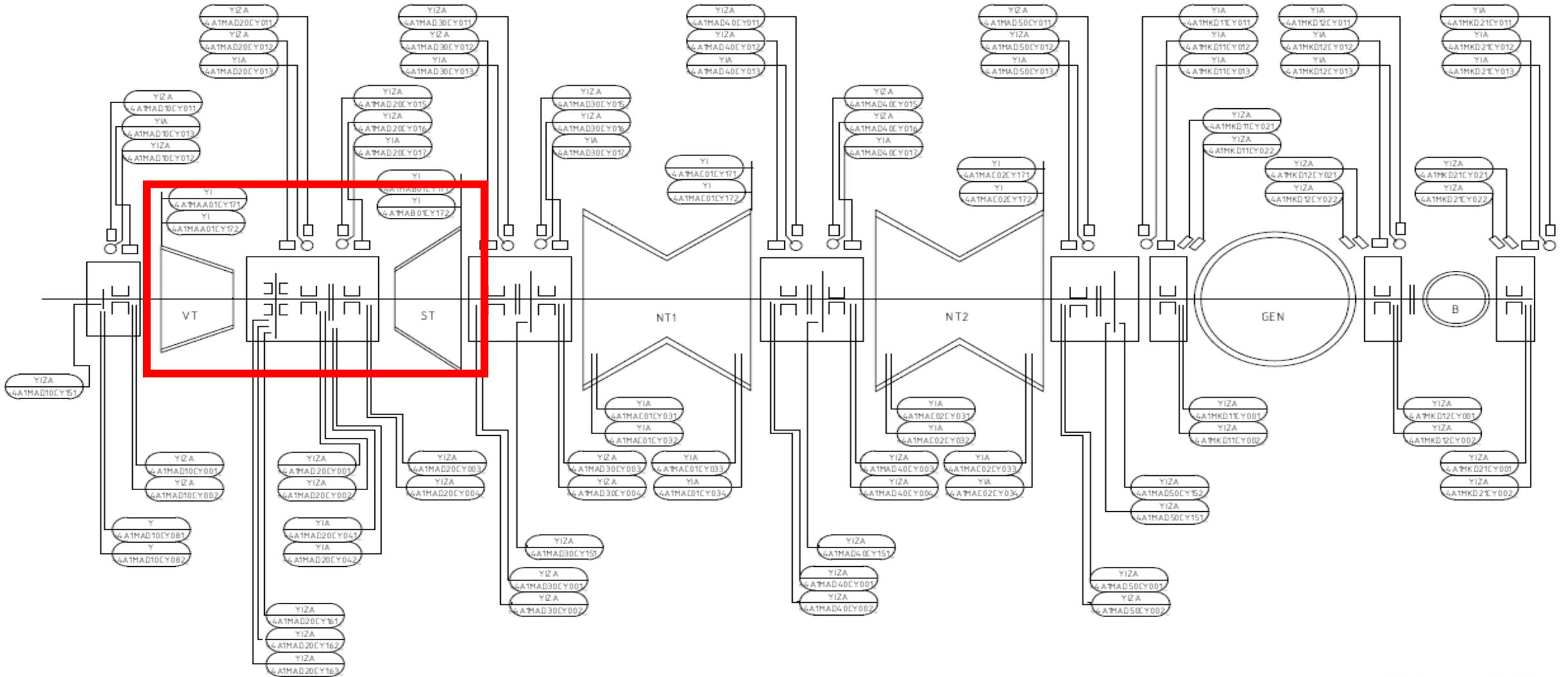


- Dividing plane

- Low pressure part steam turbine

- Generator

Turbine



Chapter III. – PI System

| Power plants | ETU2 | EPR2 | ETR | PPC | EET | ELE | EHO | EPO | EDE |
|--------------|-------------------------|------|-----|-----|-----|-----|-----|-----|-----|
| Devices | 54 | 68 | 5 | 18 | 8 | 23 | 1 | 3 | 6 |
| Sensors | More than 3 000 sensors | | | | | | | | |

Device types

TG – steam/gas turbine

TN – turbo boiler feed pump

EN – electro boiler feed pump

KV – Induced draft fan

VV – Forced draft fan

RV – gas recirculation fan

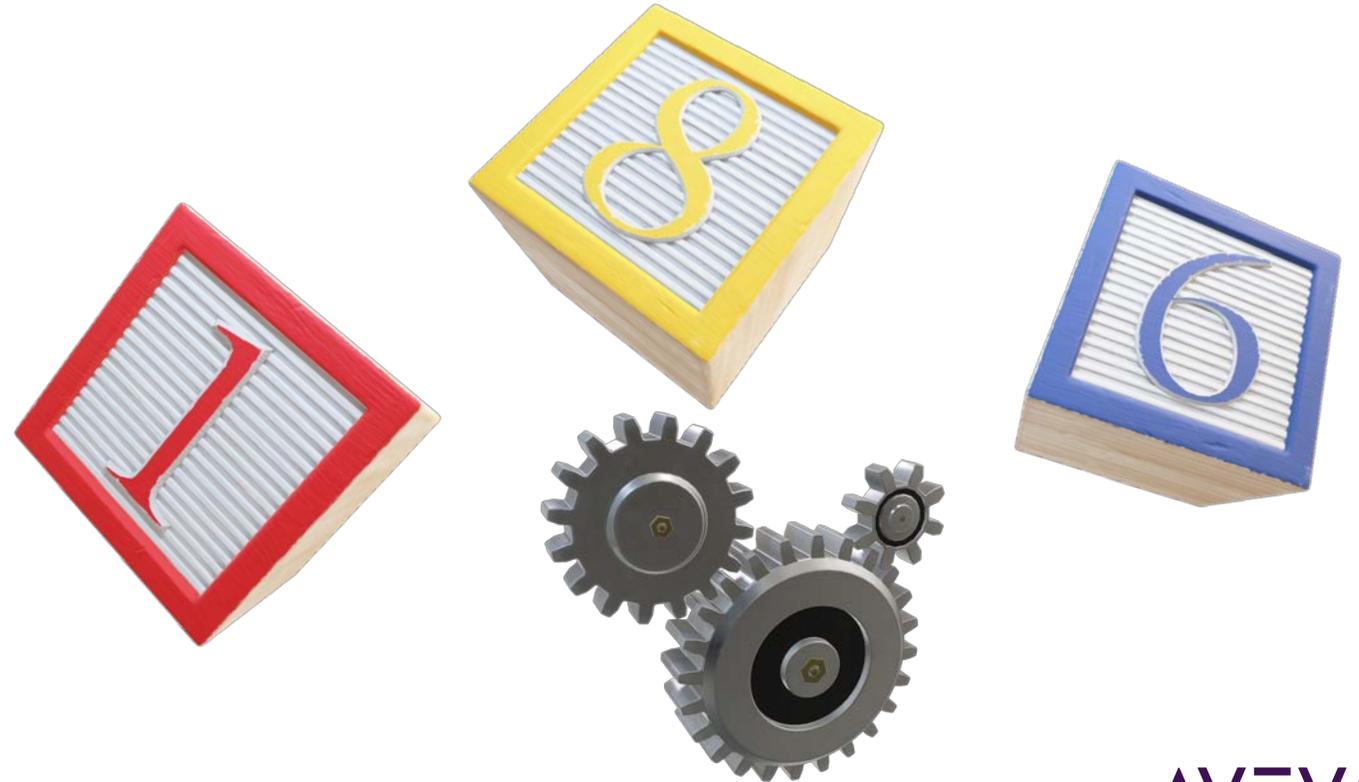
VM – pulverised fuel mill

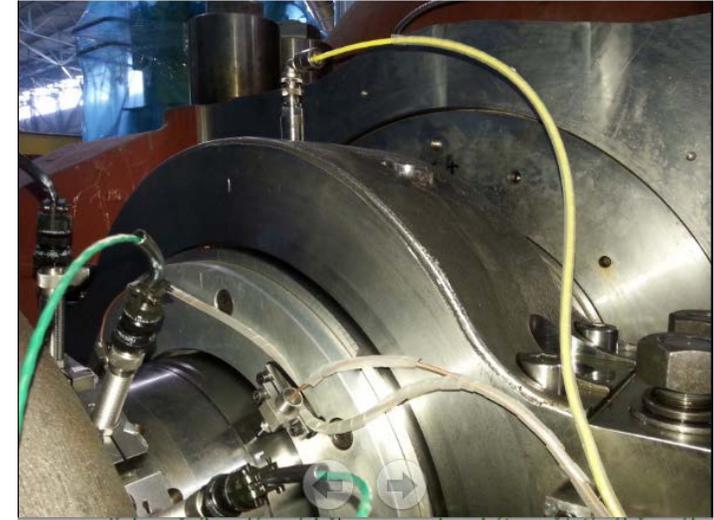
CCHV – cooling water pump

CSV – raw water pump

OXI – air compressor

KC – condensate pump





Challenges

- Reduce the number of the staff in offices
- Simplify of work
- Increase staff performance
- Unify the method of equipment evaluation
- Economies

Solution

Deployed the AVEVA PI System technology for semi-automatic evaluation of vibration and temperature monitoring devices with:

- PI Vision
- PI DataLink
- PI Asset Framework,
- PI AF Analytics,

Benefits



PI Vision

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PI Datalink

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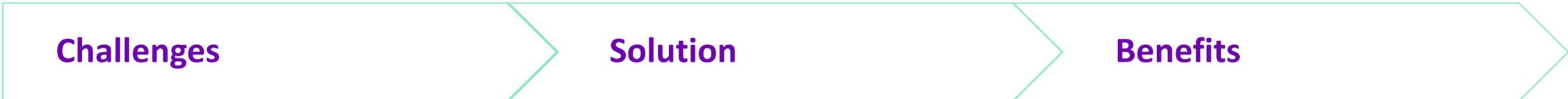
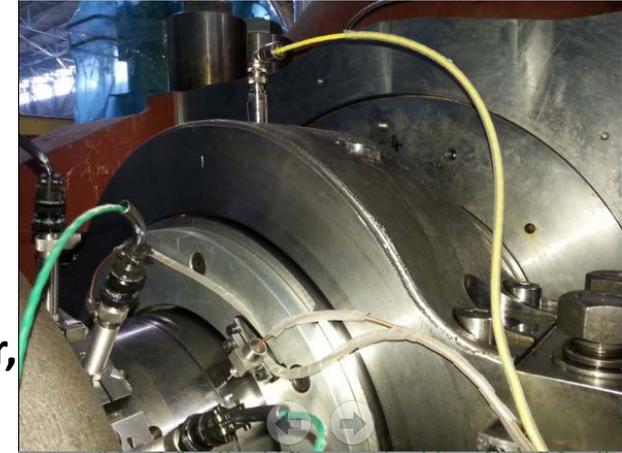
PI System Explorer

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CHAPTER IV. - Summary of results



Entire system was implemented by two people only, one vibration and one IT specialists. All major works were completed within 1 year, but some minor settings are still ongoing.



Challenges

- Reduce the number of the staff in offices
- Simplify work
- Increase staff performance
- Unify the method of equipment evaluation (evaluation by one person)
- Savings and money spent on the roads

Solution

Deployed the AVEVA PI System technology for semi-automatic evaluation of vibration and temperature monitoring devices with:

- PI Asset Framework, ✓
- PI AF Analytics, ✓
- PI Vision ✓
- PI DataLink ✓

Benefits

- Clear insight to rotating equipment condition
- Quick overview of the device status

Note

Creating a new device in PI AF and displaying it in PI Vision is a matter of a few hours.

CHAPTER V. - FUTURE

1

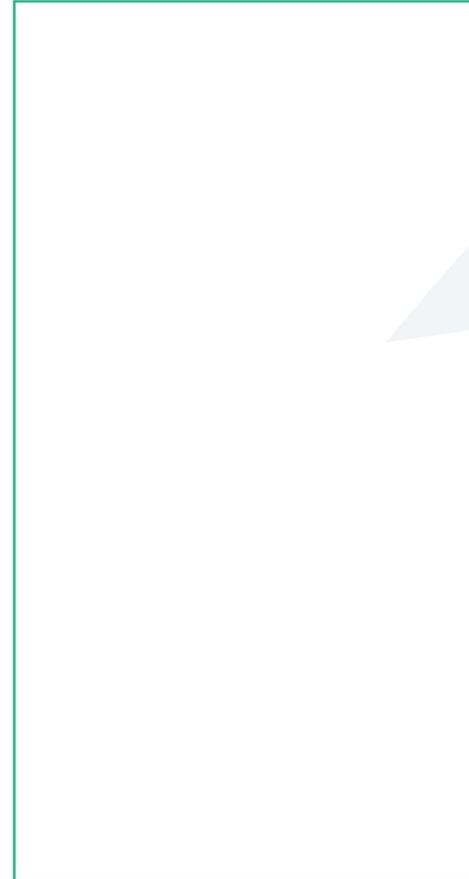
EXTENDING

Implementing online monitoring into our hydroelectric powers

2

SOLVING

Solving the problems of an automatic evaluation during the machine start-up and shut-down



The biggest challenge

?

PREDICTION

Using of neural networks for predicting devices behavior

AVEVA™ Predictive Analytics ?



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 DZIĘKUJĘ CI
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 SPASIBO
 ПАСИБО
 GRAZIE
 МАТУР НУВУН
 ХВАЛА ВАМ
 MULȚUMESC
 PAKMET CIZGE
 GO RAIBH MAITH AGAT
 БЛАГОДАРЯ
 GRACIAS
 МАНАДСАНИД
 ТИ БЛАГОДАРАМ
 TAK DANKE
 RAHMAT
 HATUR NUHUN
 PAKKA PÉR
 PAXMAT CAĠA
 CÁM ƠN BẠN
 WAZVIITA
 FALEMINDERIT
 TAPADH LEIBH
 KEA LEBOHA
 БАЯРЛАЛАА
 MISAOTRA ANAO
 WHAKAWHETAI KOE
 DANKON TANK TAPADH LEAT
 SALAMAT
 GRAZIE
 SHUKRA
 HVALA
 FAAFETA
 ESKERRIK ASKO
 HVALA
 TEŞEKKÜR EDERİM
 OBRIGADO
 MERCİ
 DI OU MÈSI
 ĎAKUJEM
 GRAZZI
 PAKKA PÉR
 PAXMAT CAĠA
 SIPAS JI WERE
 TERIMA KASIH
 UA TSAUG RAU KOJ
 ТИ БЛАГОДАРАМ
 СИПОС

Questions?

Please wait for the microphone

- State your name and company

