Slide 1

Faculty of Geoinformatics
UNIVERSITY OF WEST HUNGARY

Geodetic Control and Setting Measurements in Mechanical Metrology

Mihály ÁGFALVI, Zsolt BOKOR, Róbert FARKAS, Róbert GYENES, Péter TARSOLY, Hungary

Department of Geodesy

Photos taken by
Zsolt Bokor (GEO)
Viktória Bődő (Assistant, GEO)
András Miklós (Mechanical Engineer, ALCOA Köfém)
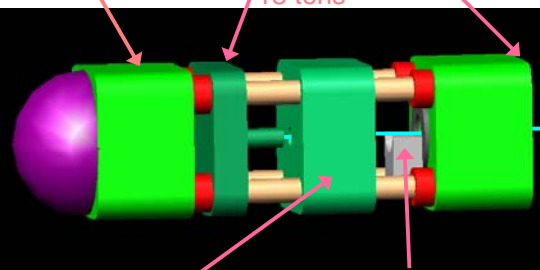
by courtesy of ALCOA

Slide 2

Content

- Control and Setting Measurements at ALCOA Köfém, Hungary
- Control Measurements at Power Station Cottam, England

This is an authorised presentation by the
ALCOA Köfém, Hungary
and
SAB GmBH, Austria

Slide 3
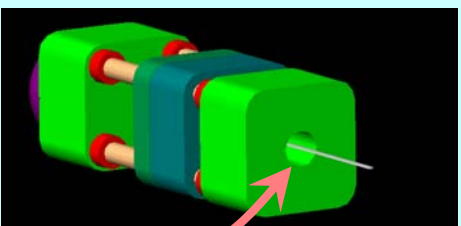
ALCOA

- One of the greatest aluminium manufacturers all over the world
- Establishment in Hungary $\Rightarrow$ ALCOA KÖFÉM
  Location : Székesfehérvár
- Half ready products
  - Moulds
  - Rolled plates
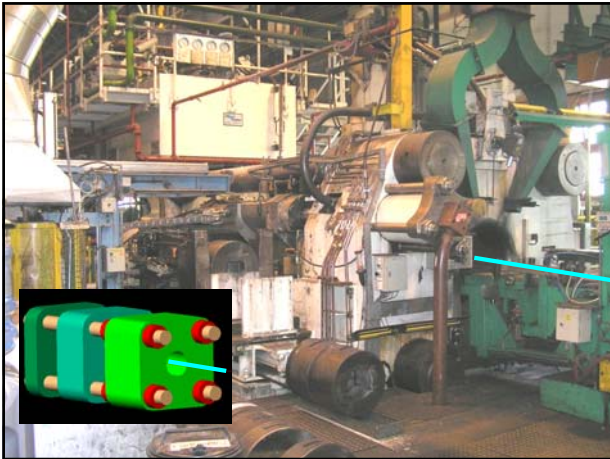 - Simple and complex shapes, e.g. wheel hoops

Székesfehérvár

Slide 4

MAIN CYLINDER
98 tons

RAM
18 tons

FRONT PLATE
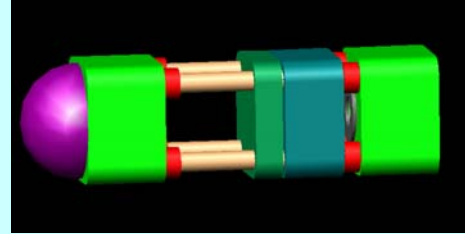40 tons

CONTAINER
11 tons

DIE EXCHANGE CASSETTE

Slide 5
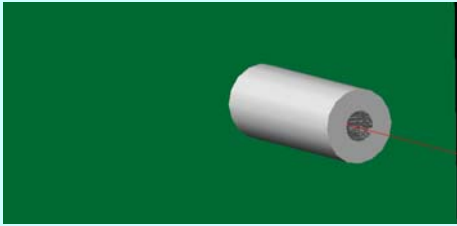
MODELLING OF PRODUCT PROCESS
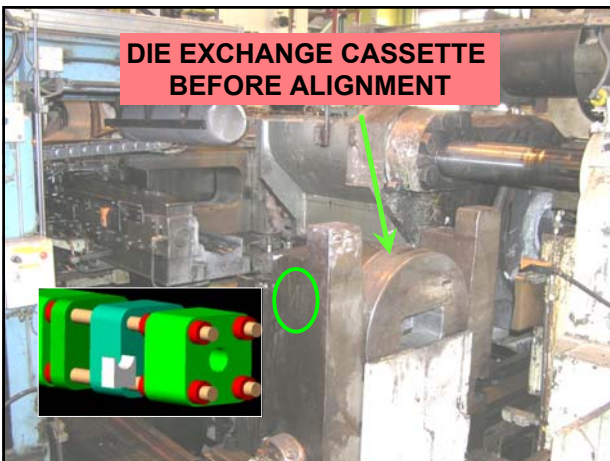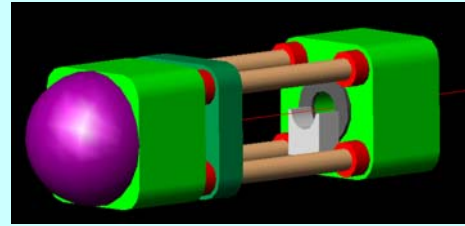
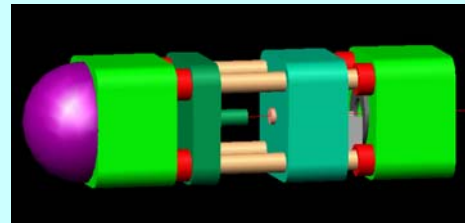## Slide 6

… and the REALITY
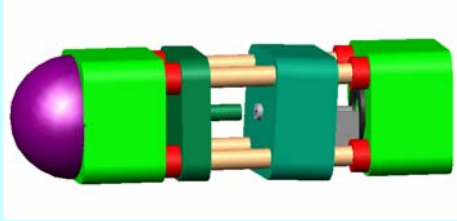
THE MOTION OF RAM

THE MOTION AND TRACKING OF THE RAM

THE ALIGNMENT OF DIE EXCHANGE CASSETTE

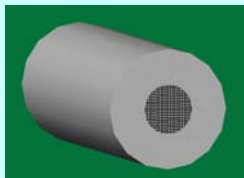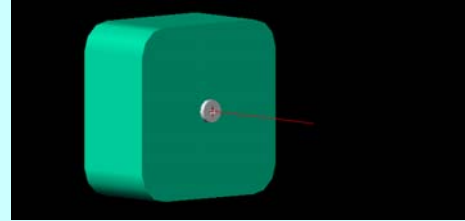DIE EXCHANGE CASSETTE BEFORE ALIGNMENT

THE MOTION OF CONTAINER

THE TILTING OF THE CONTAINER DURING ITS MOTION
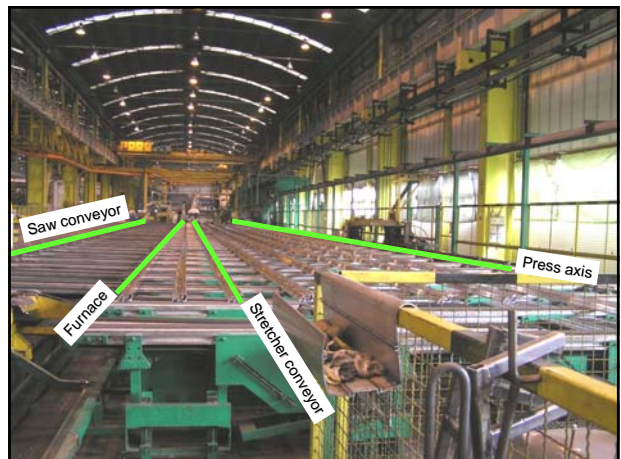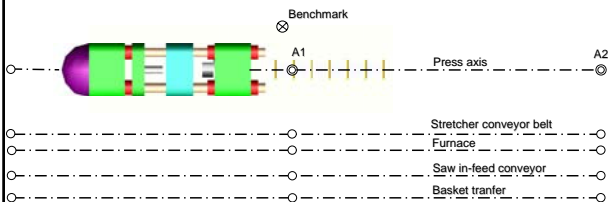

ALIGNMENT OF MEASURING TUBE IN THE CONTAINER

MEASURING SCALE MOUNTED ON THE RAM TUBE

CROSS HAIR MOUNTED ON THE CONTAINER TUBE

GEODETIC REFERENCES

THE STAKING NETWORK

Benchmark

A1 Press axis A2

Stretcher conveyor belt
Furnace
Saw in-feed conveyor
Basket tranfer

Saw conveyor

Furnace

Stretcher conveyor

Press axis

THE TYPE OF MEASUREMENTS

- **NI 002 A and TOTAL STATION**
- Need for level – the height of initial position of main cylinder
- Requisite for accuracy ≤ 1" to keep 0.1 mm $\Rightarrow$ TC 1800

Control and Setting Process
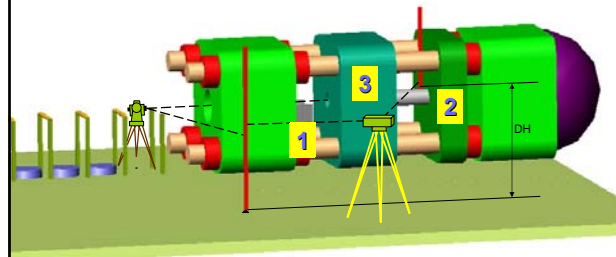
1. **EXCHANGE CASSETTE : CONTROL (AND SETTING)**
2. **RAM : CONTROL AND SETTING**
3. **CONTAINER : CONTROL AND SETTING**
4. **EXCHANGE CASSETTE : CONTROL (AND SETTING)**

THE ACCURACY OF OBSERVATIONS

- **Non-preheated press**
  - Horizontal : 0.1 mm
  - Vertical : 0.1 mm

- **Preheated press**
  - couple of tenth mm, it cannot be said precisely
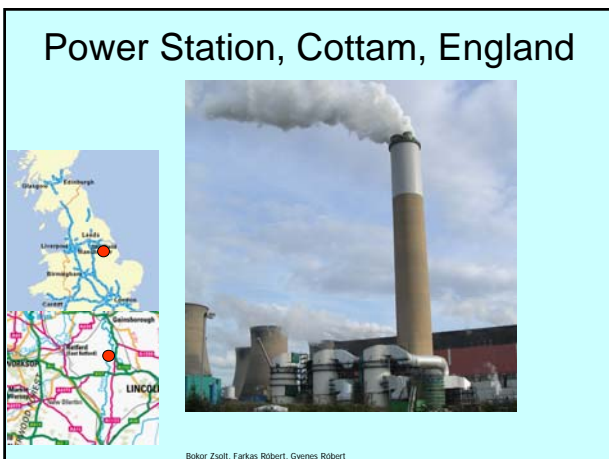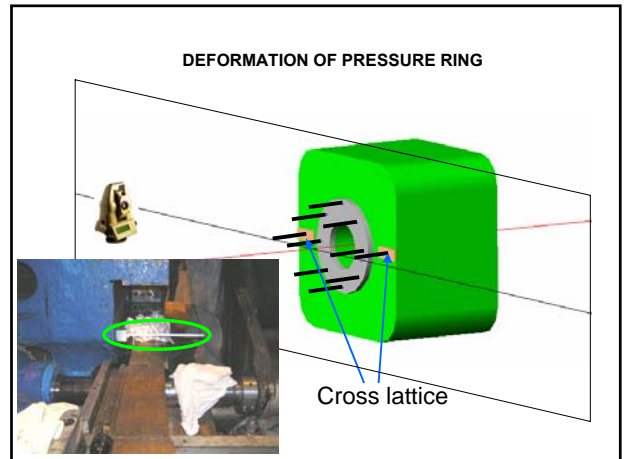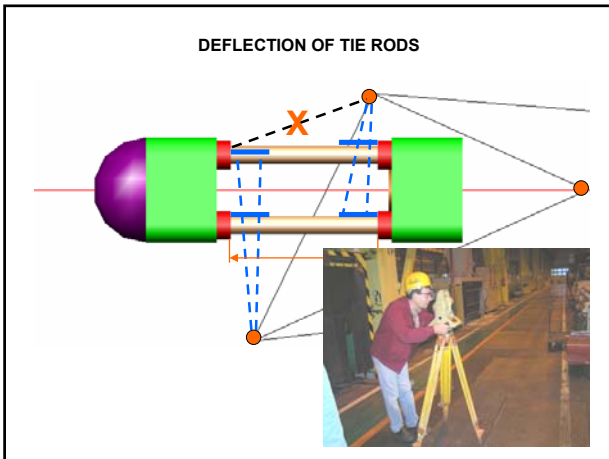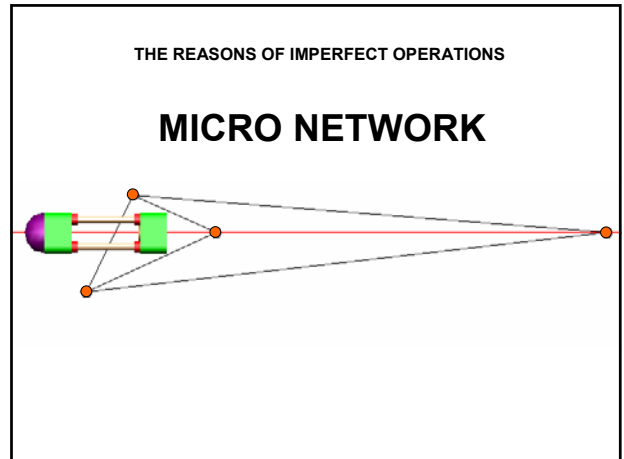
MAJOR FACTOR

- The time of observations
  - By night in the case of 90 per cent
  - Observer's attention and concentration capability

TIME NEED

- **EXCHANGE CASSETTE : couple of minutes**
- **RAM : 1 … 3 … (5) hours**
- **CONTAINER : 3 … 6 hours … (days)**
- **EXCHANGE CASSETTE : couple of minutes … 1 hour**

Extreme case : May 2000, almost four days with longer breaks

THE REASONS OF IMPERFECT OPERATIONS

THE REASONS OF IMPERFECT OPERATIONS

PRESSURE RING

OF

THE REASONS OF IMPERFECT OPERATIONS

MICRO NETWORK

DEFLECTION OF TIE RODS

X

DEFORMATION OF PRESSURE RING

Cross lattice

Power Station, Cottam, England

Bokor Zsolt, Farkas Róbert, Gyenes Róbert

The Task

Network

- Horizontal
  - Relative accuracy = 1/40000, average distance = 50 m
  - Mean RMS of points = 2 mm
- Trigonometric network
  - RMS of Height differences = 1.5 mm
  - Mean RMS of heights = 1.5 mm

Measuring Method

Receiving Units

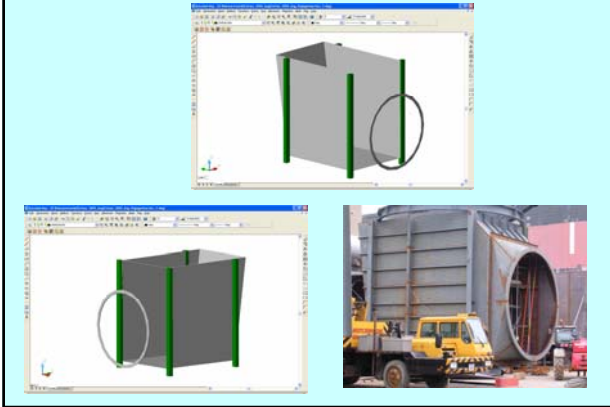## Receiving Units

Embedded Units

- Circle Parameters by Regression
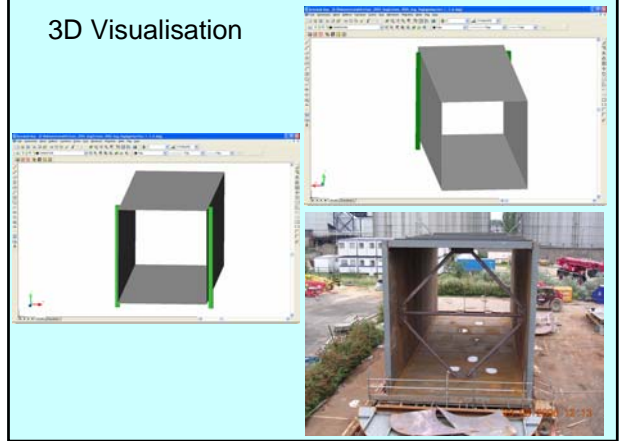

R = 2773 mm   R = 2768 mm
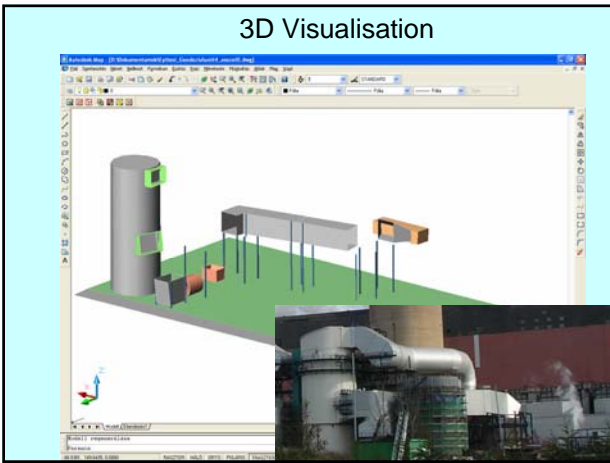
3D Visualisation

3D Visualisation

3D Visualisation

3D Visualisation

Thank you for your attention …

… any question ?