

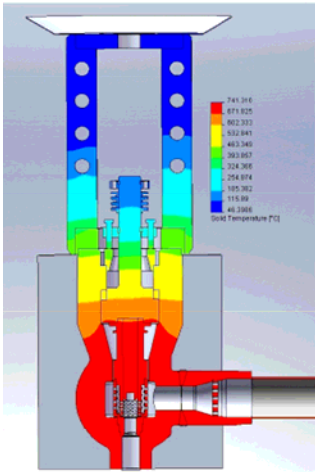
## Project COMTES700 - objectives

Project **COMTES 700** =  
**Component Test** Facility for a **700 °C** Power Plant

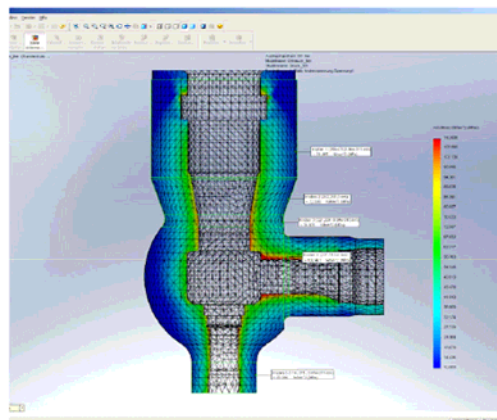
### Objectives:

- to design in detail, manufacture, erect and operate a CTF with advanced materials
- Welding and NDT of the materials, e.g. Alloy 617
- evaluation of residual service life
- in-service inspections
- operational testing of Ni-based
- operational behaviour of all components

CFD calculation of the temperature distribution in the solid



FEM calculation of the stress in the solid



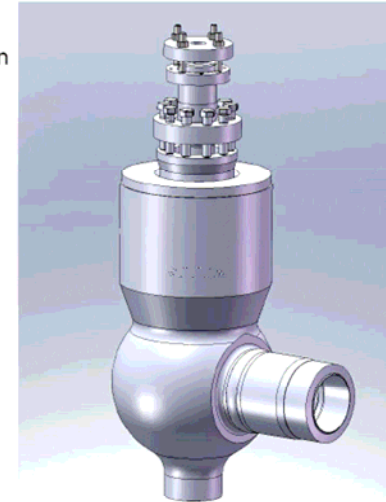
## HP bypass valve 50plus - Application and Technical data

Application in 550 MW PP 50plus:

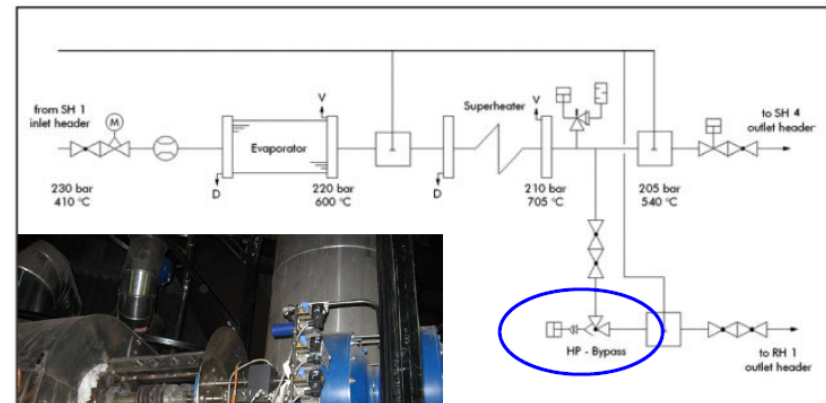
Turbine Bypass for starting up and shut down  
 Safety valve for the high pressure section

Mass flow:	4 x 85 kg/s
Inlet parameters:	705°C / 365 bar
Outlet parameter:	425°C / 84 bar
Water injection:	20 kg/s
Inlet / outlet Ø:	115 / 212 mm
Material valve body:	Alloy 617 mod.

Flow direction under the plug (FTO)  
 hydraulic actuator  
 Secondary desuperheating



## CTF flow diagram with HP-Bypass valve



**705 °C**  
**205 bar**  
**12 kg/s**  
 operating conditions

## Challenge “700°C technology”

### General technical hurdles ...

Fabrication of forgings and pipes

Qualification of capable materials for pressure parts

Qualification of welding procedures (PQR / WPQ)

**Ni-base Alloy**

Shape-cutting processing to finish part

Qualification of NDT methods

Forming processing to finish part

## machining of the valve casing

### Ni-base alloys show ...

High hardness, strength and ductility

Bad heat conductivity

Tendency towards cold work hardening

### Challenges ...

Low cutting speed

High stiffness of the machine, tool and clamping

Machining operation without interruption, if possible

Large feeding of coolant and lubricant



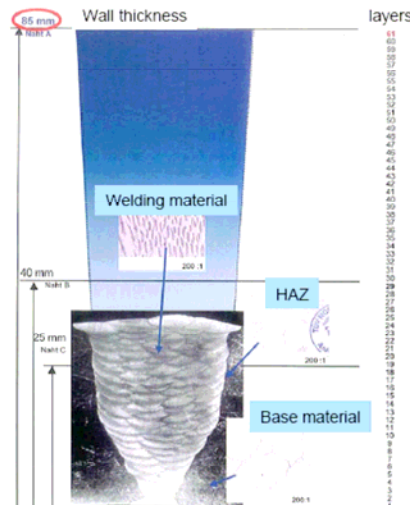
## Welding technology – COMTES700 project

comparison of buildup sequences :

production welding with 61 layers

Decision for NDT = PT after root + 1/3 of wall thickness

welding procedure qualification with 25 layers



## conclusion

### experience ...

from COMTES700 project

### outlook 50plus ...

Welder and welding procedure approvals (WPQ / PQR)

welding of outlet nozzle

8 times higher welding times



Ni-base alloy 617 mod

### valve design ...

to consider the extrem requirements (705°C, 365 bar)

to validate by virtual prototyping and pilot tests

### machining ...

robust lathe

9 times higher cutting times

3 times higher wear of cutting tools