

OTS implementation and training experience at Slovnaft FCC unit

Tomáš Pavlík

APS forum, May 26th 2011



Slovnaft

MEMBER OF THE MOL GROUP

Agenda

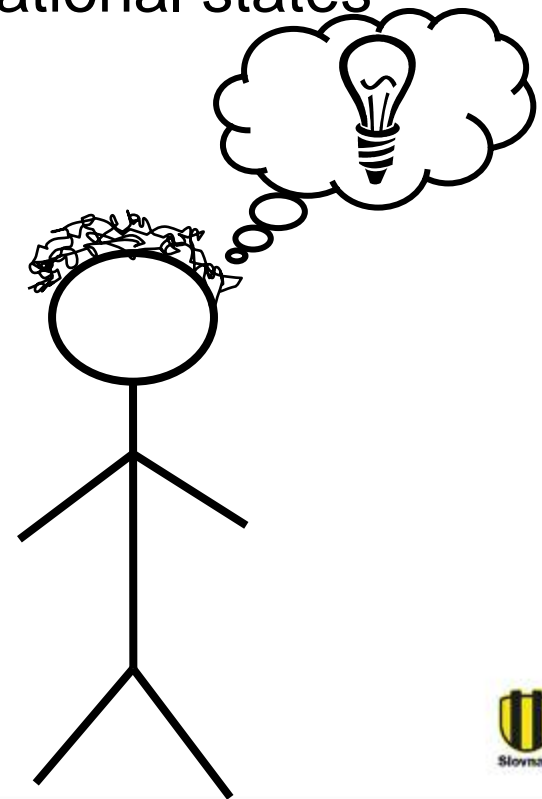
- What is OTS?
- OTS in Slovnaft
- OTS project story
 - The beginning
 - FAT (Factory acceptance test)
 - Happyend
- Trainings
- Operator satisfaction survey
- Learning points
- Next steps

What is OTS?

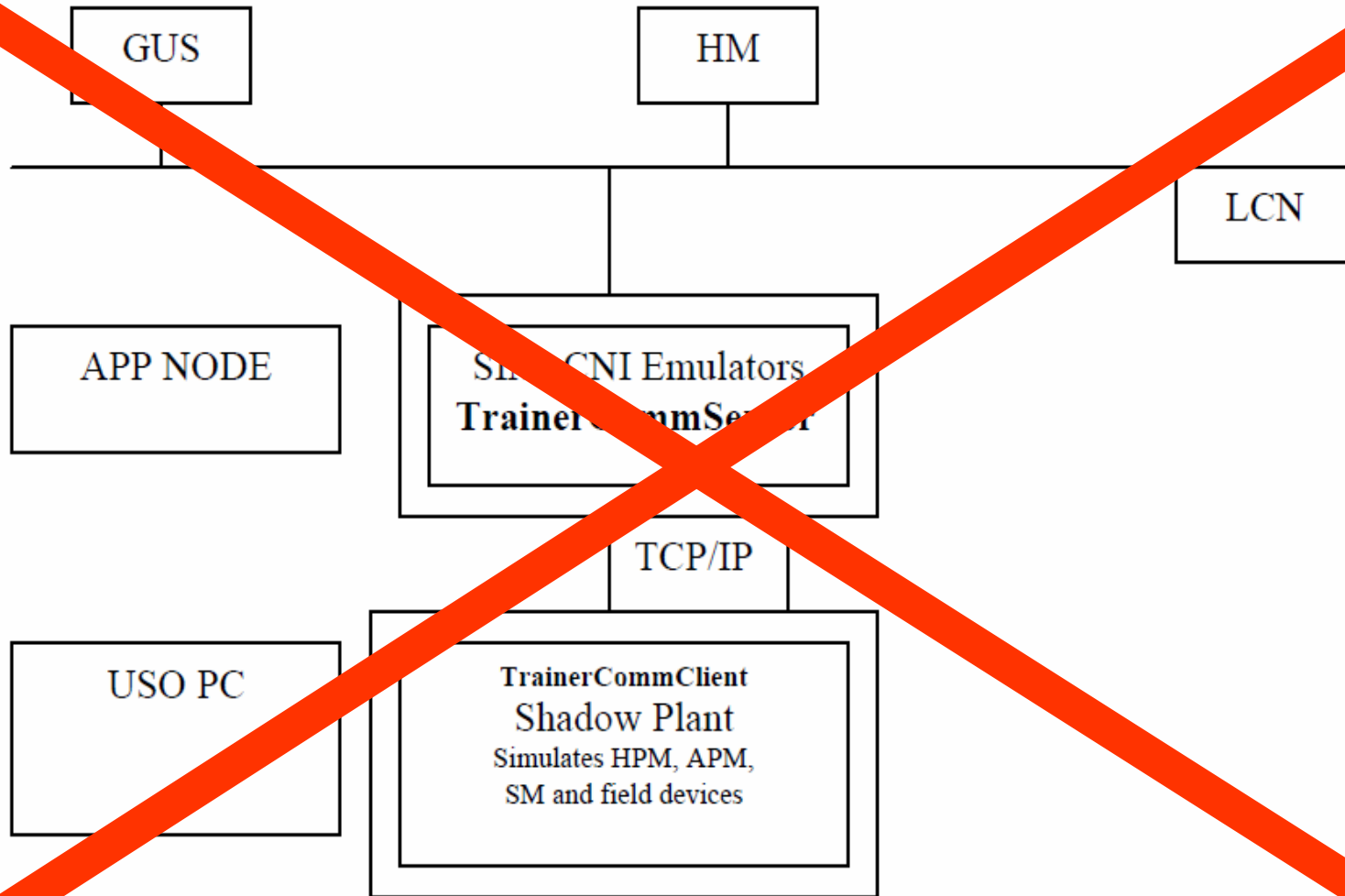


What is OTS?

- OTS – Operator training system
 - Real-time simulation system
 - Imitates operation of a real plant
 - Identical interface
- Simulates normal and abnormal operational states
- Usage
 - Training of existing operators
 - Training of newcomers
 - Engineering studies (limited)



Main parts of OTS

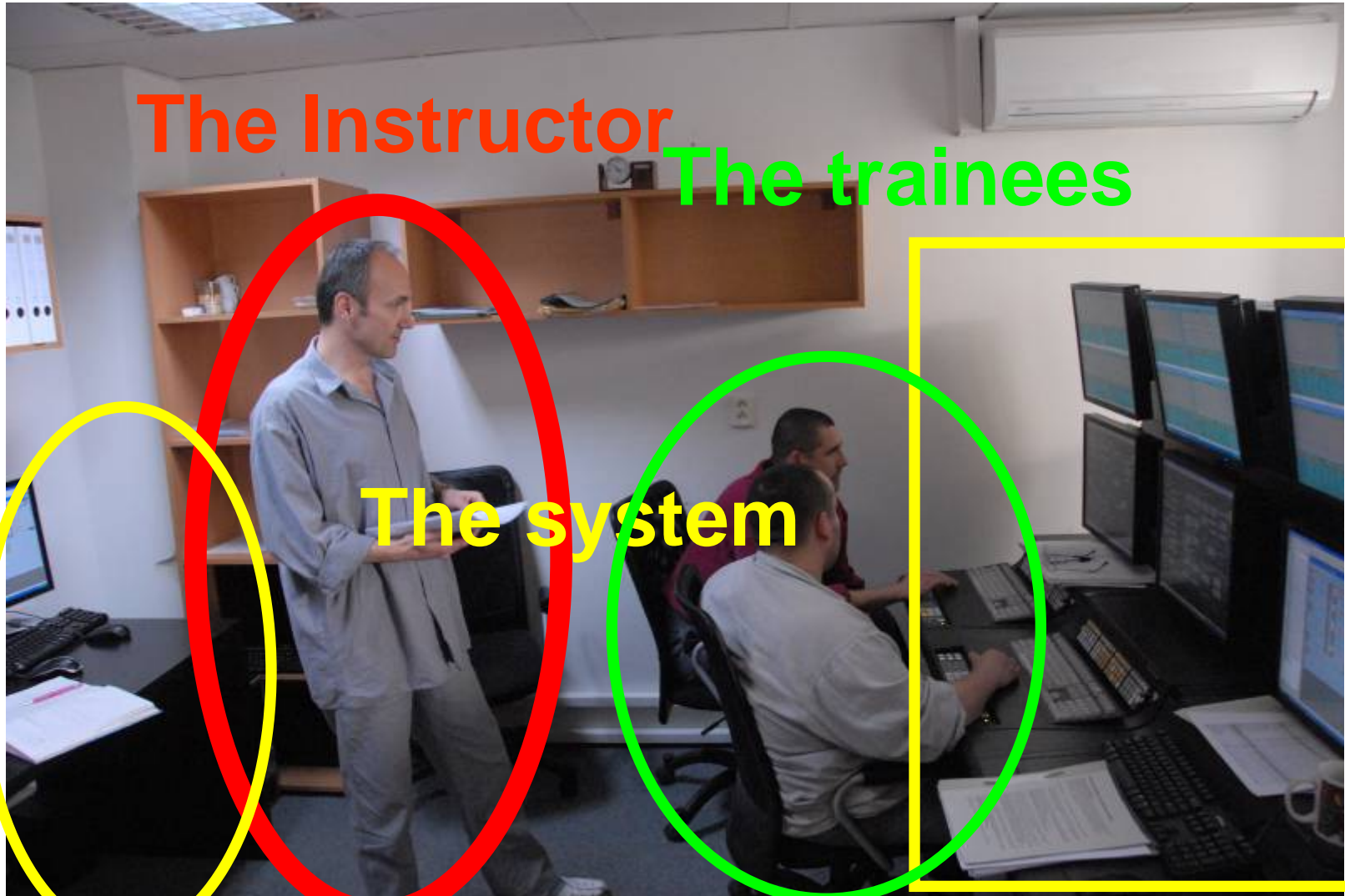


Main parts of OTS

The Instructor

The trainees

The system



Main parts of OTS - INSTRUCTOR

- Prerequisites for a good instructor
 - Voluntary
 - Full-time
 - Experienced in unit operation
 - Teaching skills
 - Workplace relationships
- Importance of a full-time instructor
 - Involvement in the project
 - Detailed knowledge of day-to-day operations
 - Trainings
 - Evaluation

OTS in Slovnaft

- One functional OTS system in Slovnaft
 - BFCCU OTS handover – January 2011
- OTS systems planned
 - BRHCK – 2012 (expected start)
 - BGHCK
- Contractor – Honeywell
 - BFCCU, BRHCK, BGHCK
- Training since July 2010

BFCCU OTS overview

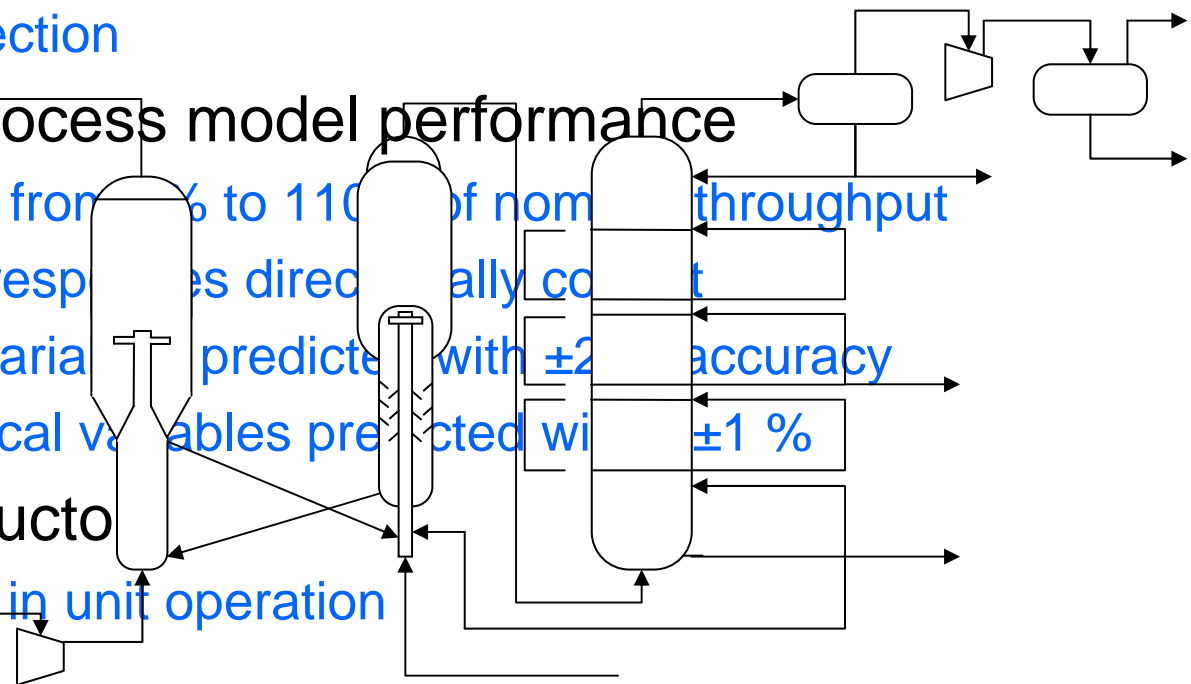
- Simulation model includes
 - Reactor and regenerator section
 - Main fractionator section
 - Gas plant section
 - Propylene section

- Contracted process model performance

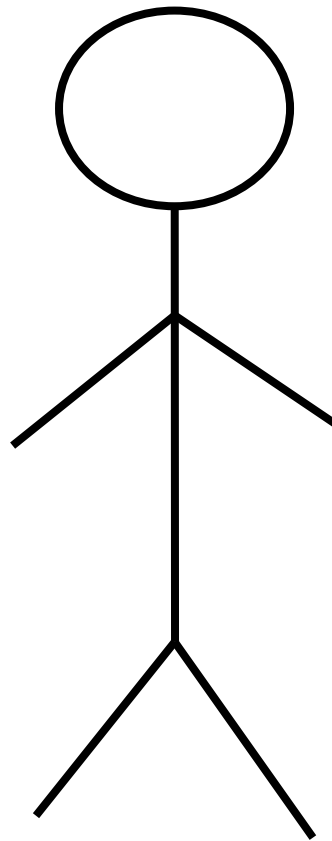
- Throughputs from 60% to 110% of nominal throughput
- All dynamic responses directly controlled
- All process variables predicted with $\pm 2\%$ accuracy
- Up to 25 critical variables predicted with $\pm 1\%$ accuracy

- Full time instructor






- Experienced in unit operation



OTS project story



OTS project story – the beginning

- Start of the project – 2007
- Original schedule
 - OTS projects definition: 1.10.2007 – 10.12.2007 
 - BFCCU OTS project preparation: 10.12.2007 – 19.5.2008 
 - BFCCU OTS project implementation – milestones
 - HW and SW delivery (July 2008) – 25% of payment 
 - DFS handover (July 2008) – 35% of payment 
 - Model acceptance (December 2008) – 30% of payment 

OTS project story – FAT

- FAT start
 - May 2009
- Duration Planned 3 weeks

What took you so long?!

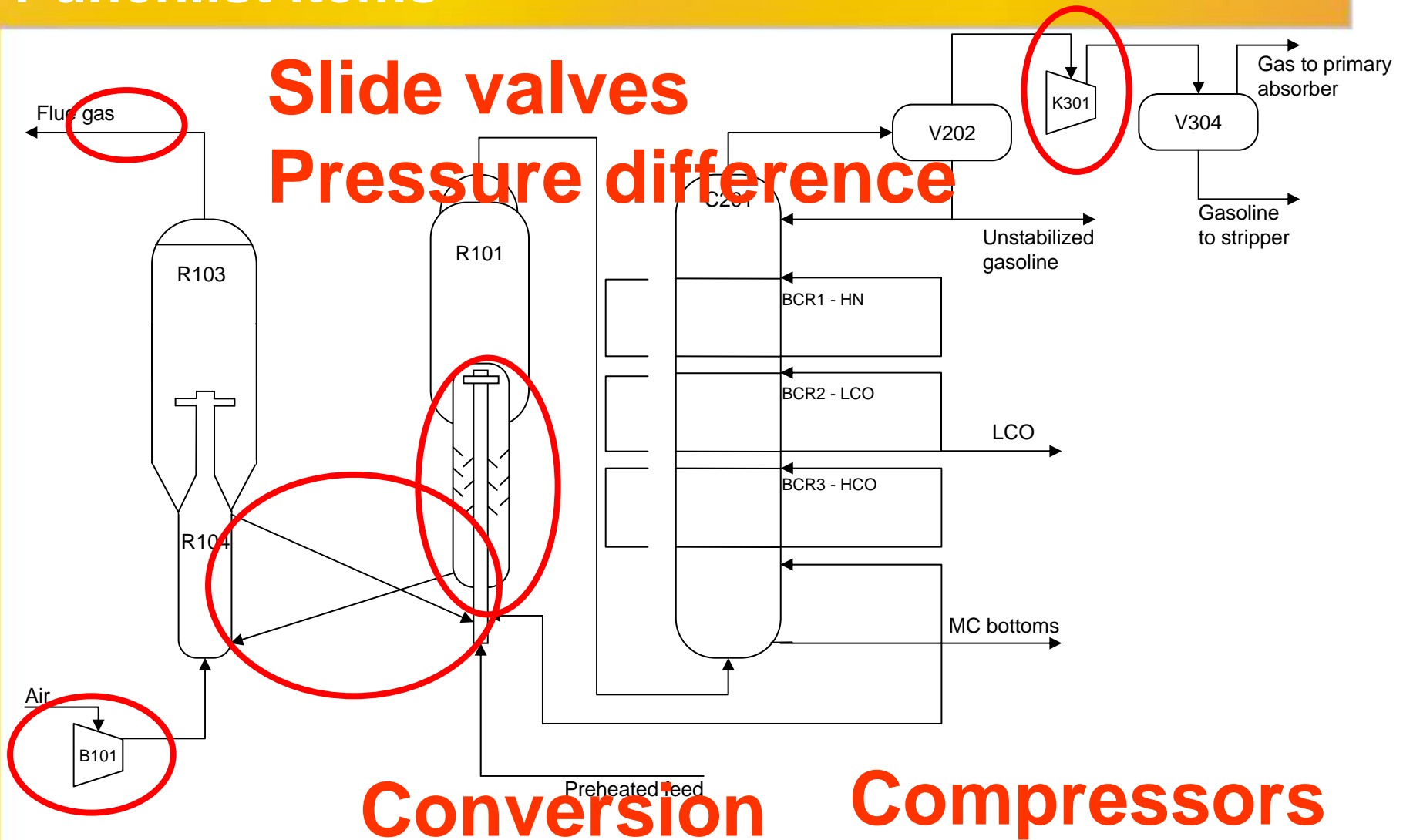
- FAT end
 - December 2010

FAT summary

- Total FAT duration: 13 weeks
- Additional testing in Slovnaft
 - 6 months (including holidays, training etc.)
- 4 punchlists plus partial punchlists during in-house testing
 - More than 200 punchlist items total
- Reasons of prolongation
 - Performance of the system
 - Non-working parts
 - Availability of contractor's staff



Punchlist items

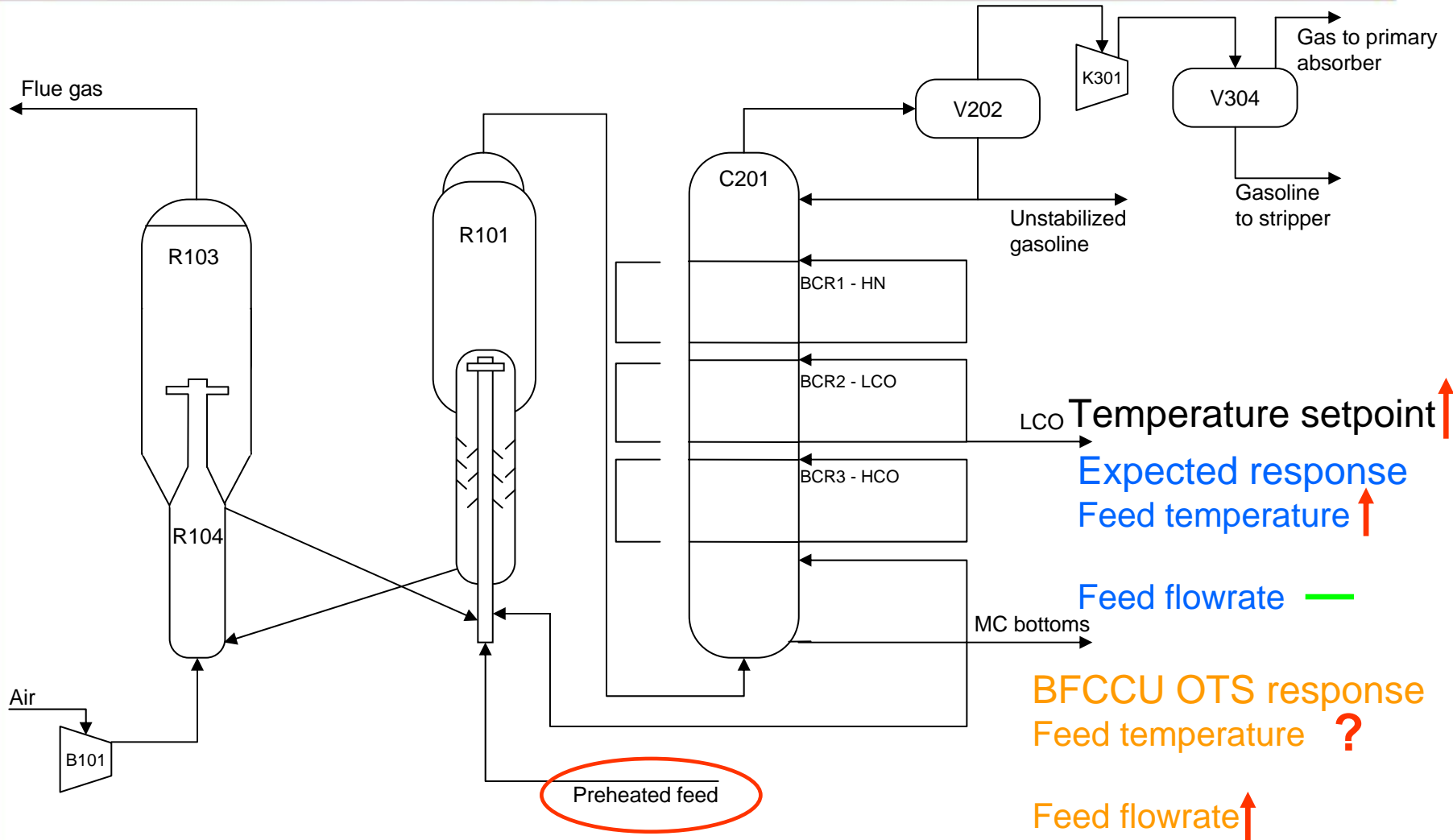


Slide valves
Pressure difference

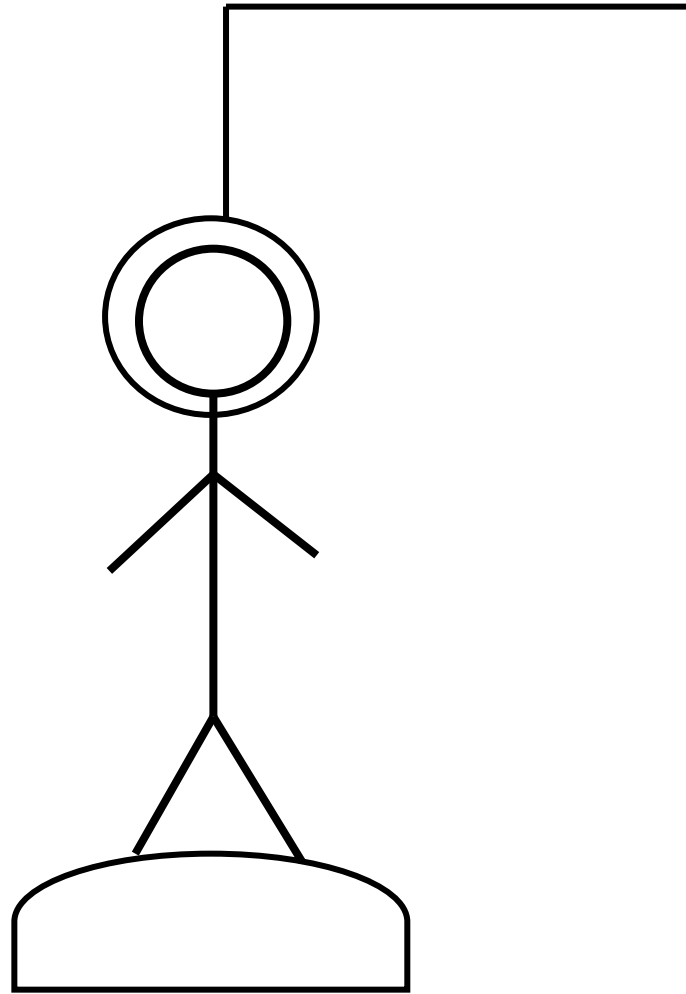
Conversion

Compressors
Antisurge

Punchlist example – preheat temperature change



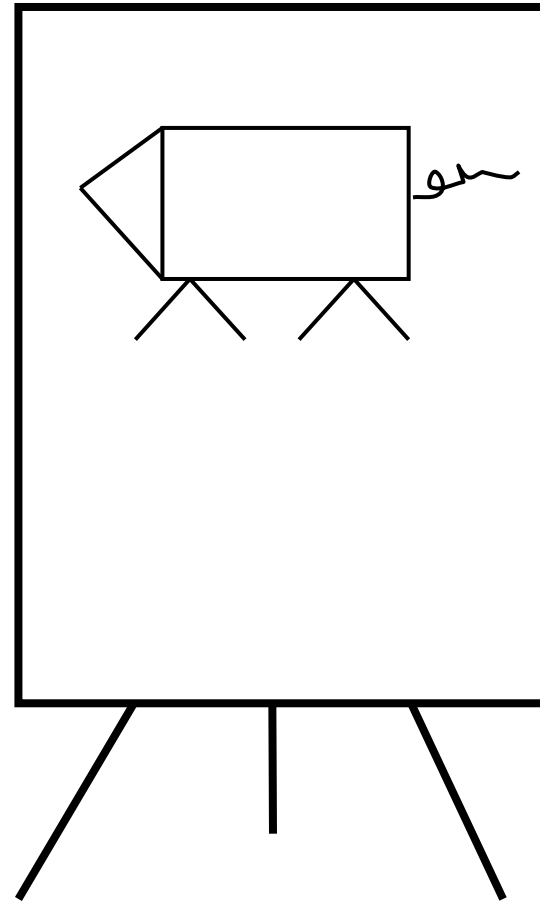
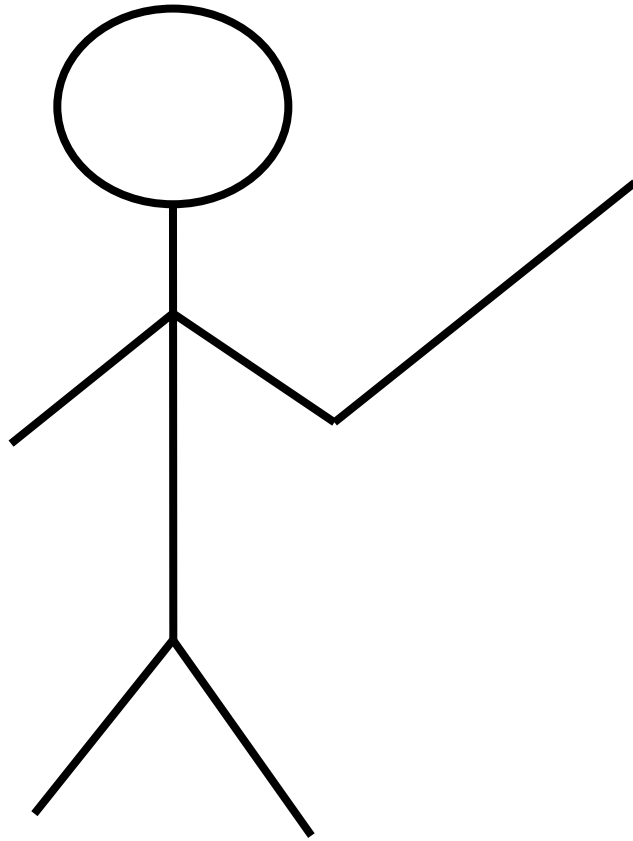
Happy end



Happy ending – OTS handover

- In January 2011 OTS was handed over to the unit
- Final punchlist was issued
- Items (deficiencies) divided to 3 categories
 - **Category 1 – can be solved**
 - 22 items – all solved
 - **Category 2 – can be improved**
 - 23 items – 4 items solved
 - **Category 3 – not feasible to solve**
 - 8 items
 - Low importance

Trainings



Trainings

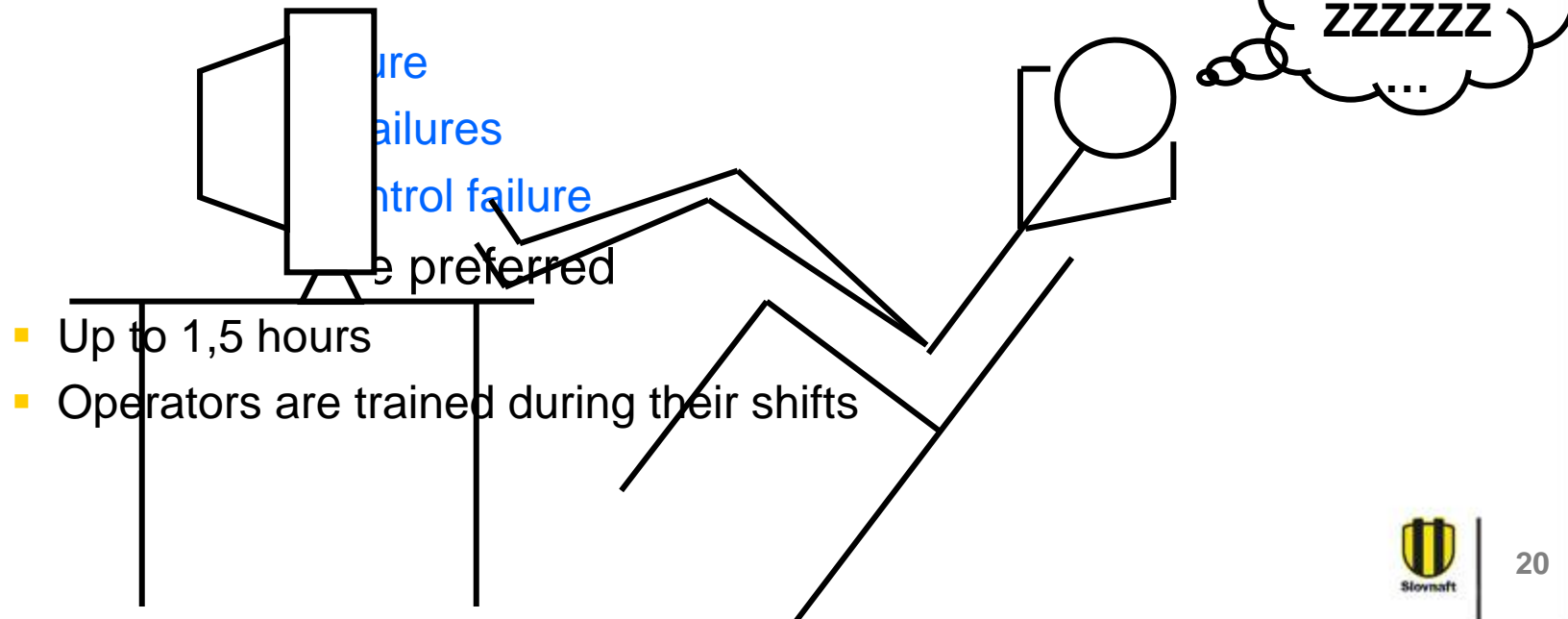
- Start of trainings – July 2010
- System was not finished
- Topics selected with regard to unsolved model deficiencies
- Response of operators was good
- 2 types of training
 - Current operators
 - Future operators

Trainings

Continuous training of current control room operators

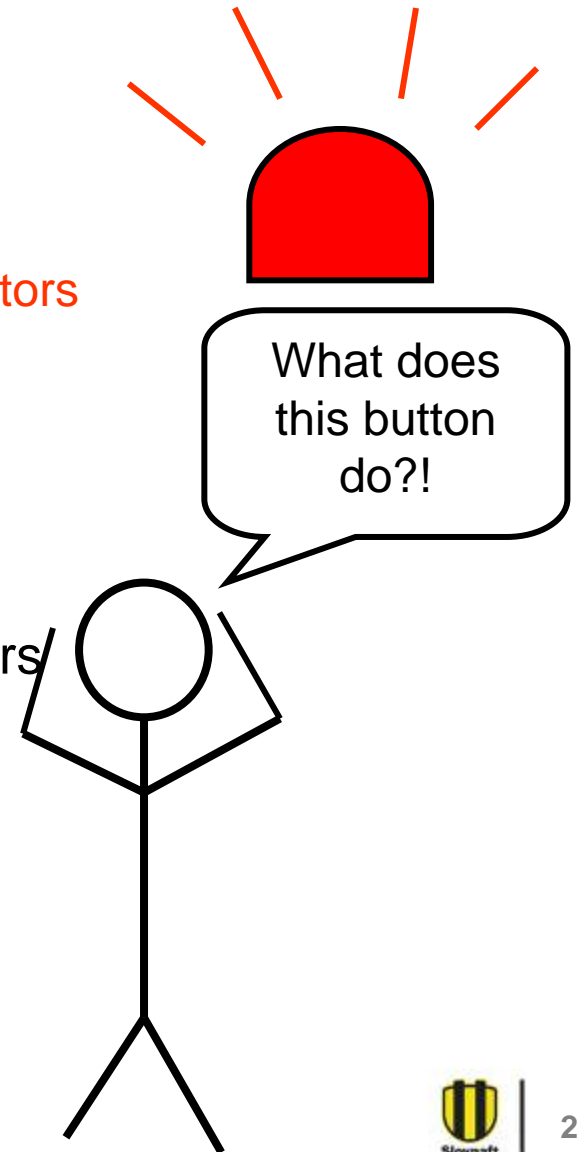
- 2 training topics each month
- Every operator is trained in both topics every month
- Trained situations
 - Custom malfunctions
 - Startup and shutdown states
 - Situations that happened at the unit

—



Trainings

- Training of future operators
 - Field operators are trained for control room
 - Extremely important
 - Upcoming retirement for many current operators
 - New operators are trained on 3 of 4 shifts
 - Main topic
 - Starting up the plant from cold state
 - Detailed explanation of every step
 - Trainings are longer than at current operators/
 - Up to 4 hours
 - Voluntary training without instructor



Trainings evaluation

- Written evaluation of trainee performance
 - Elaborated after each training by the instructor
- Instructor training in February 2011
 - Scenario creation
 - Scenario automatic evaluation
- Scenarios will be elaborated for minor topics in 2011
 - Automatic evaluation may be used as a part of complex operator evaluation only

Trainee satisfaction survey

- Anonymous survey with 8 questions
 - Scale 1-10 points

Model response to process changes	
Dynamics of model response	
Personal impression about trainings	
Asset to theoretical knowledge about unit operation	
Asset to practical knowledge about unit operation	
Theoretical knowledge of the instructor	
Understandability of lectures	
Overall impression about the system	

Learning points

- Preparation phase
 - Choose staff carefully
 - Instructor importance
 - Critical variables
- Project phase
 - Identify problems as early as possible
 - Stick to your process knowledge
 - Simulation vs. real plant
 - Be patient
 - Deadlines vs. quality
 - Write down everything
 - Punchlists
- After project phase
 - Still learning

Next steps

- Continue in trainings
- Create scenarios
- Implement OTS at next 2 units
 - BRHCK
 - BGHCK
 - *Instructor necessary*
- OTS documentation
- APC revamp project
- OTS benefits expressed in money



**Thank you for your
attention**