

L90 Esbjerg: Results

Main parameter:

1 Line for approx. 210.000 t/a throughput

B&W Vølund, Denmark

Turbine 18 MWel, Steam 54 MWth

Average heating value 10,6 MJ/kg

20 employees !



Defined optimisation targets:





- Fully automatic operation for operators relief
- Reduction standard deviation steam mass flow

Reasons for decisions for PiT

Navigator:

- **self learning adaptivity**
- fast return on investment
- **easy handling**
- guaranteed results

L90 Esbjerg: Results

	PiT Navigator ON		PiT Navigator OFF		Difference 
	Average	Standard dev	Average	Standard dev	
Standard deviation steam		3,2		7,2	-55,6% 
Throughput [t/h]	96,5		95		1,6%
Reduction 850°C shortfall	2,4		7,9		-69,6% 
Manual intervention burnout control	2,0		4,0		-50,0% 

Jan Fletcher Hansen, Technical Director L90 Esbjerg:
 „Without the Powitec System it would not be possible to operate the plant with such a continuously high output and a staff of only 20 people“



 = Guarantee

*Fully automatic control over **98,2%** of operating time over 45.000 hrs*



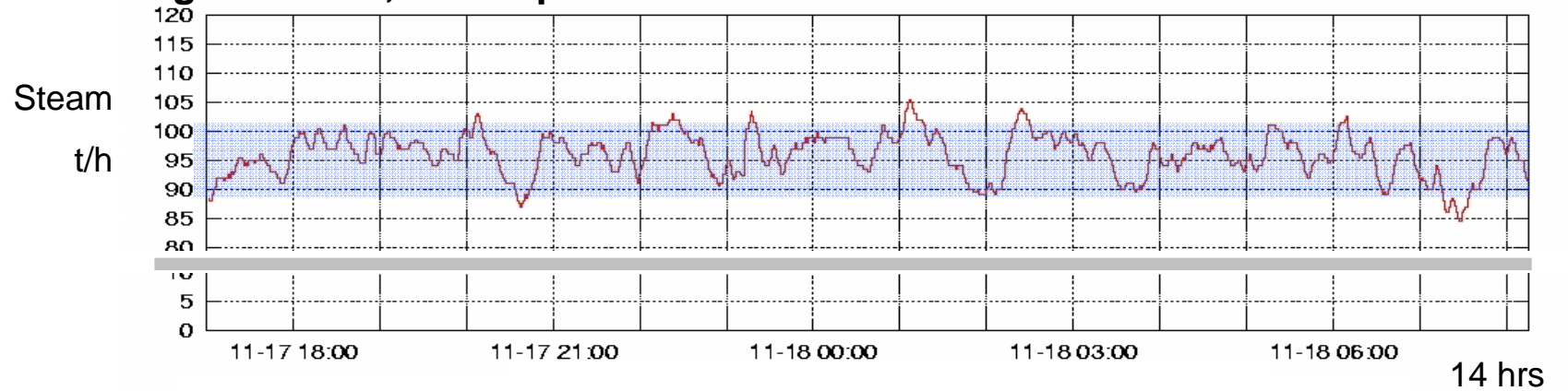
Long Term Results

September 2008 to March 2009	
	Powitec Online
Steam set point [t/h]	95,95
Steam actual [t/h]	96,46
Steam actual sd [t/h]	4,53
Steam control deviation [t/h]	1,37
Steam control deviation [%]	1,45
O2 [Vol%]	3,52
O2 sd [Vol%]	0,49
CO [mg/Nm3]	7,52
CO sd [mg/Nm3]	4,60
Burn out line	31,19
Burn out line sd	7,68

Steam production w/wo PiT Navigator

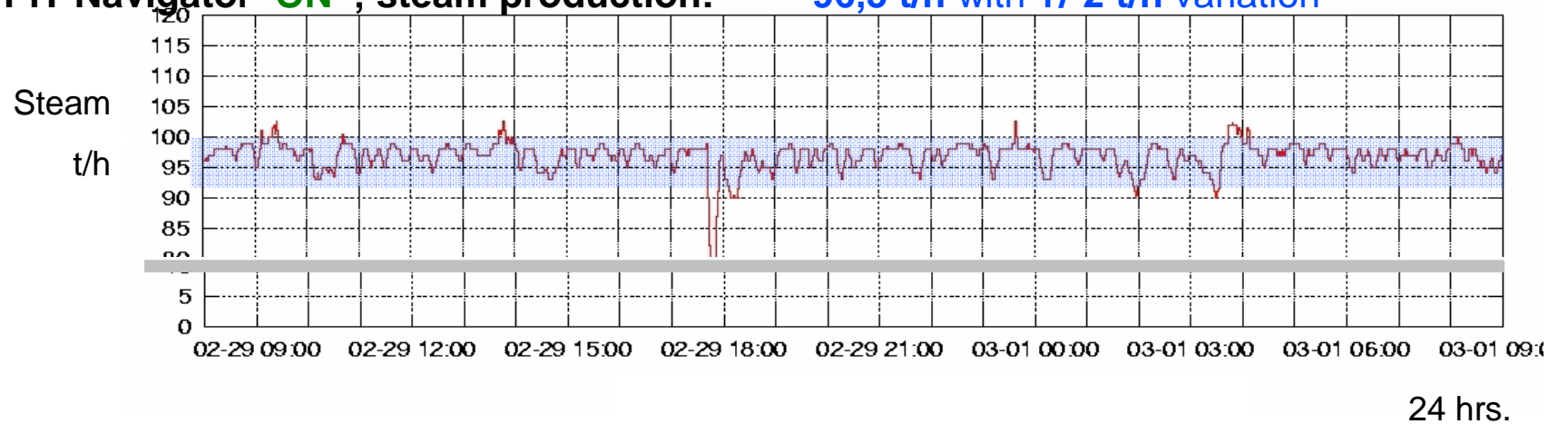
PiT Navigator **'OFF'**; Steam production:

95 t/h with +/-5 t/h variation

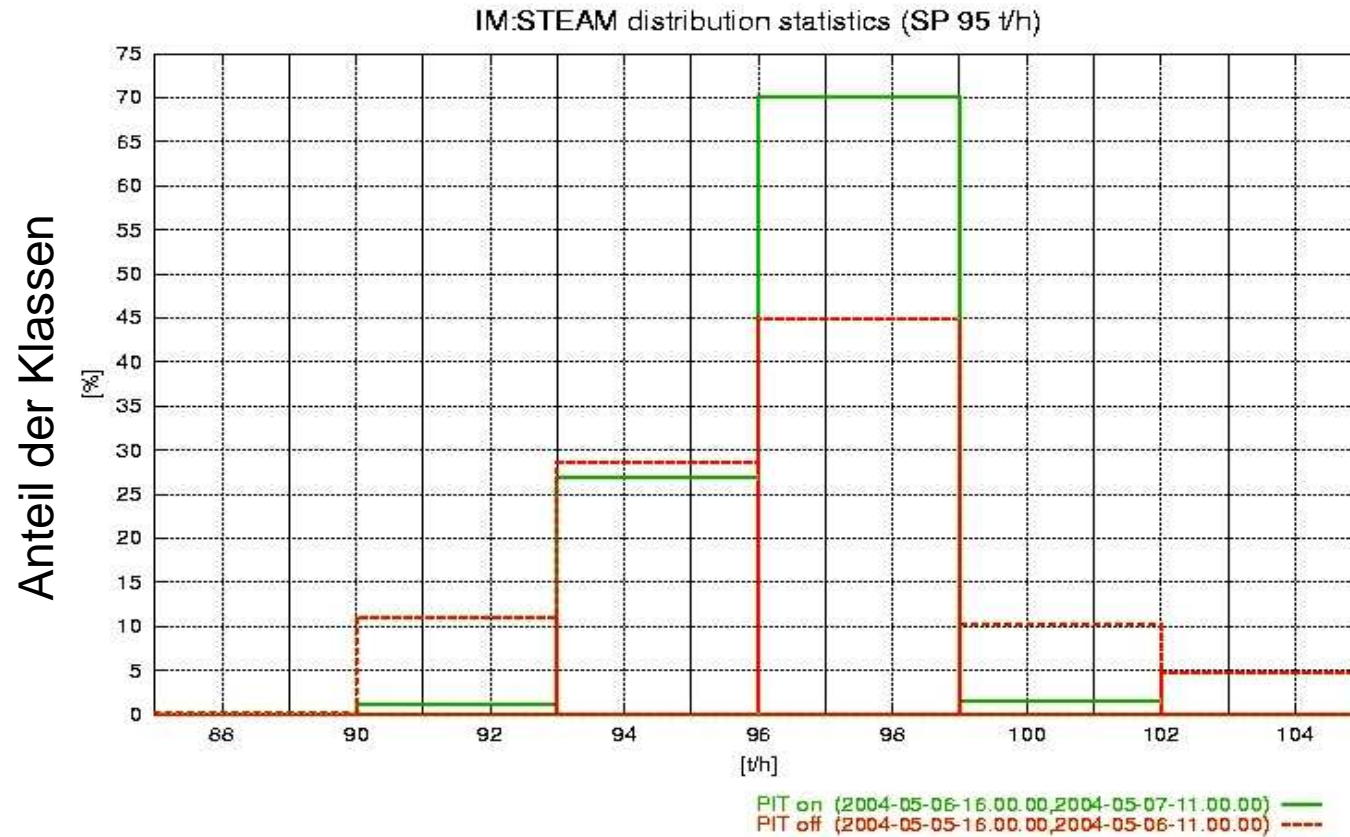


PiT Navigator **'ON'**; steam production:

96,5 t/h with +/-2 t/h variation



Steam mass flow distribution



Distribution steam mass flow - PiT on
Distribution steam mass flow- PiT off

Set-Point Matrix in the Esbjerg ABB DCS

Primary air flow per grid sector



Grid speed per sector



Secondary air distribution



Set-point of the DCS controller



Set-point of the PiT Navigator

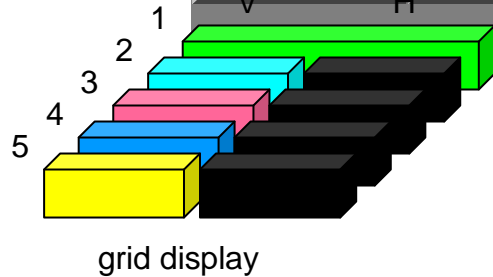


It is possible to take single loops on manual mode. The optimiser will control then without this channel



'Auto-pilot' on/off

Powitec set-point correction in the DCS (overview)



Primary air control of the Advanced Combustion Control (ACC) on the left side of the furnace

Please consider the individual set-point limits per sector! Here the 8 hour plot

Safe achieving of 850°C border in Esbjerg L90

3 Month:

2004-07-01-00.00.00 to 2004-10-01-00.00.00

Time frames with temp. < 850°C

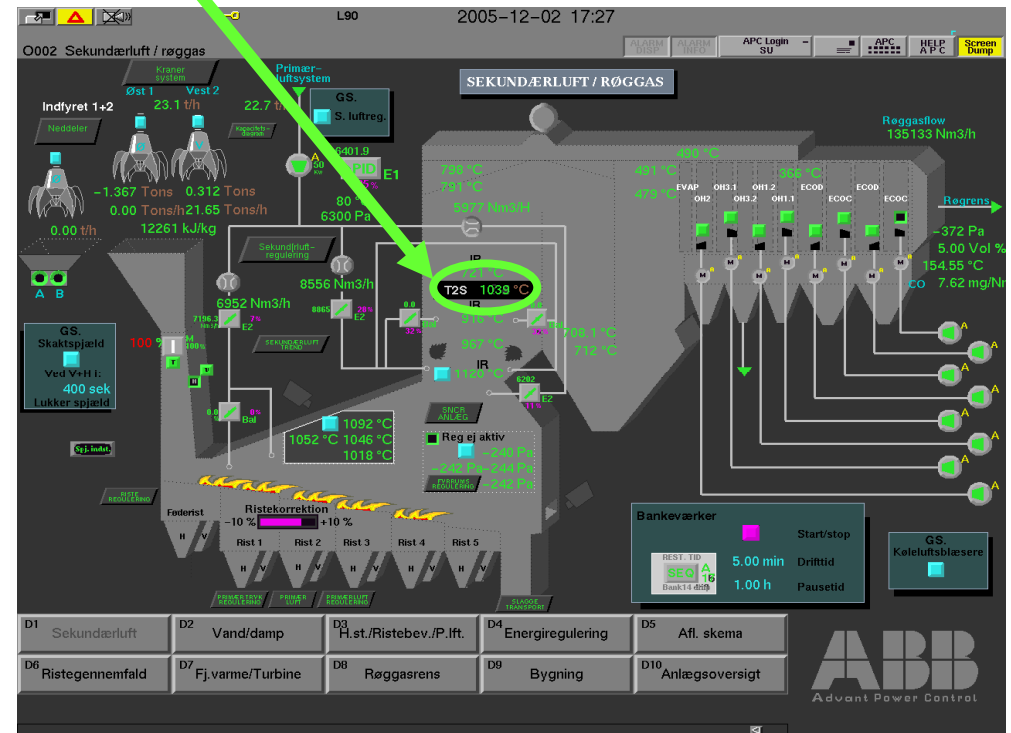
PiT ON

PiT OFF

2.4%

7.9%

percent of operating time



Optimised burn out at Esbjerg L90

3 month:
2004-07-01-00.00.00 to 2004-10-01-00.00.00

Direct operator interception during burn out problems
(Temporarily speed reduction grid 5)

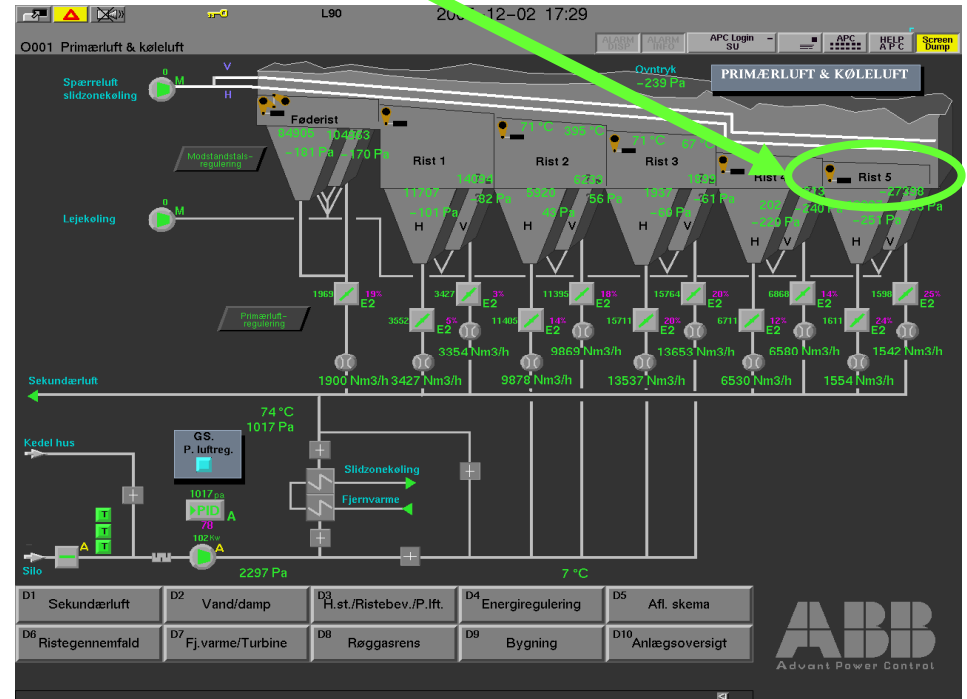
PiT OFF PiT ON

Grid 5 left **4.60%** **1.81%**

Grid 5 right **4.23%** **1.98%**

percent of operating time

Less operator interception necessary



Esbjerg, DK: Successful Combustion Optimisation

- *More evenly steam mass flow*
(Reduction of the standard deviation from 7.2 to 3.2 at 95 t/h)
 - => Increase of waste throughput
 - => Maximised electricity production

- *Reduction of operating time below the temperature limit 850°C*
(7.9% to 2.4% at PiT ON)
 - => Better control in keeping the pollution limits
 - => Reduction of supportive fuels usage to zero!

- *Reduction of manual interventions for burn-out control*
(~4% to ~2% at PiT ON) 98,2 % full automatic operation!
 - => Ensuring the total burn-out of the waste
 - => Reduction of unburned in ash

Mr. Hansen, Technical Director Esbjerg

- *“The commissioning of the ACC does not need much attention from operators side! “*
- *“The day to day operation of the system is very easy!”*
- *“No reprogramming, no readjustments were necessary during more than 12 month operation!”*
- *“The maintenance is limited to clean the cameras lenses all 6 month only!”*

”Our plant staff is very convinced about the PiT Navigator. It makes the day to day work much easier!”