Panos Konstantin

Power and Energy Systems
Technologies & Economics

Case Study
Cycle Simulation
Extraction-Condensing-Reheat

Notes:
1. Cells with black characters include inputs
2. Cells with red characters include formulas
3. Download of FluidEXL required for calculations
4. Read brief instruction for FluidEXL in the **Toolbox** in the book
5. Read introduction and notes in Case Study chapter of the book

The purpose of this Case Study is:

1. Training in calculation of thermodynamic cycles using FluidEXL
2. Calculation of performance parameters for cogeneration such as $\sigma, \beta, \eta_{cond}, \eta_{total}$

Last update March, 2016

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Disclaimer

The Examples are solely and exlusively indented to provide support and assistance to the readers for practicing and better understanding of the theoretical part of this book.

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The author, Panos Konstantin, believes that all information and guidance provided and all calculations in these examples are correct. Nevertheless anyone using these examples should carry out their own due dilligence and appraisal of the contents.

No warranty is made nor responsibility or liability is taken or accepted by the author for adequacy, completeness or accuracy of the examples or assumptions on which they are based.

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Proposals for improvements of the contents are welcome and will be considered in upcoming updates!

Last Update March, 2016

See Case Stude 11

TE-CaseStudy-12_Modelling-Simulation-Extraction-Cond-Rankine-Cycle_Reheat.xls

Inputs

Item	Unit	Operation Mode	
		Cond	Cogen
Live steam	t/h	463.9	
Pressure	bar	185	
Temperature	°C	540	
Saturation temperature	°C	359	
HP bleed points			
Pressure HP bleed	bar	40	
Terminal temperature difference	K	2.0	
Pressure HP bleed	bar	23.5	
Terminal temperature difference	K	1.0	
Process Steam extraction	t/h	0	50
Pressure	bar	12	
Terminal temperature difference	K	2.0	
Process Steam extraction	t/h	0	45
Pressure	bar	6	
Terminal temperature difference	K	3.0	
Process Steam extraction	t / h	0	40
Pressure	bar	3	
Terminal temperature difference	K	4	
LP bleed	bar	0.7	
Terminal temperature difference	°C	5	
Condenser			
Cooling water inlet	°C	15	
Cooling water temperature rise	K	12	
Terminal temperature difference	K	4	
Boiler efficiency	%	92.0%	
ST- internal efficiency	%	91.0%	
Generator efficiency	%	98.6%	
ST- mechanical efficiency	%	99.5%	
Condensate return rate	%	100%	
Temperature	°C	90	
make-up water	°C	15	

altering inputs in yellow cells only

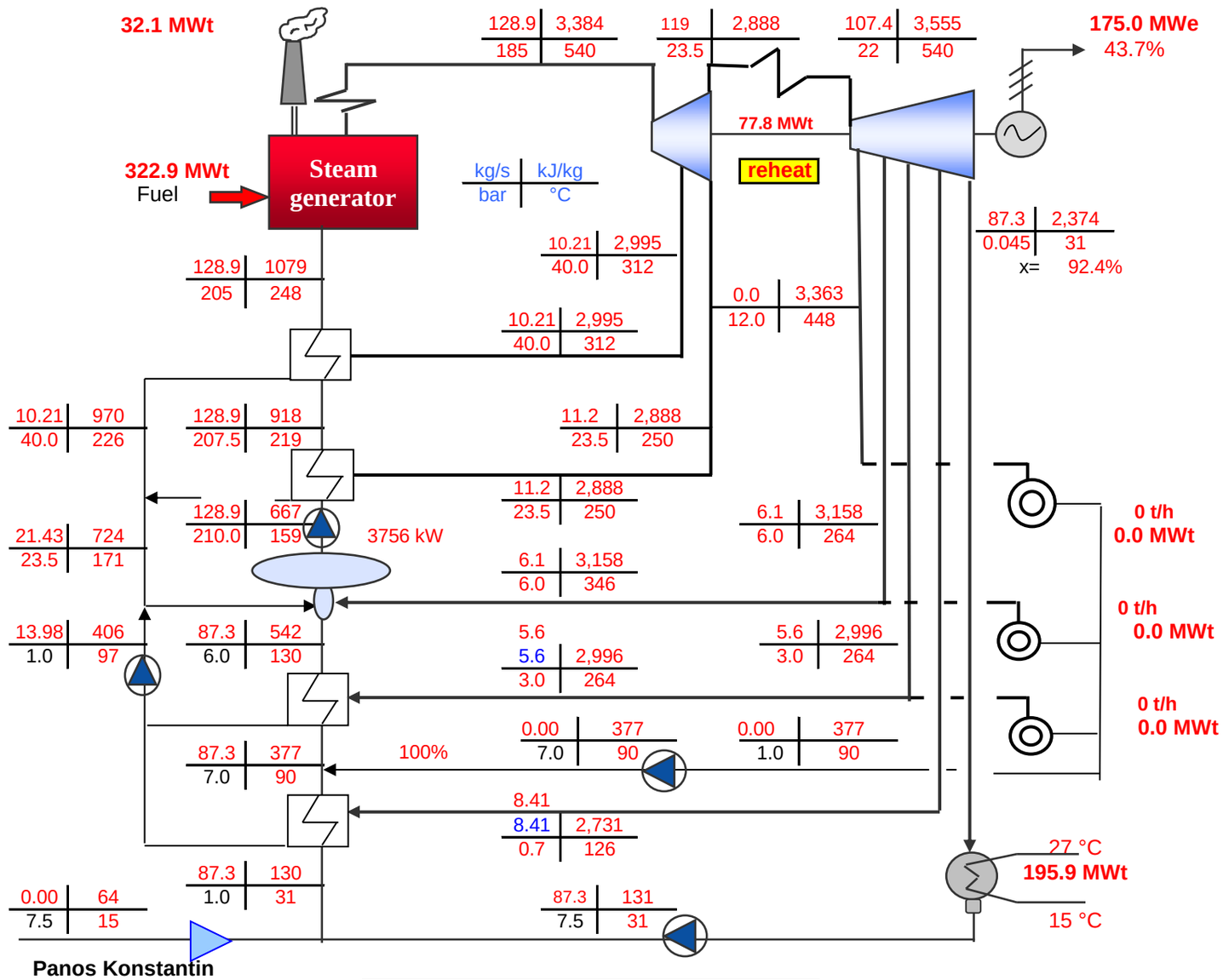
Use goal seek function of Excel to alter power output

12 ± 2 bar allowed

6 ± 1 bar allowed

3 ± 1 bar allowed

TE-CaseStudy-12_Modelling-Simulation-Extraction-Cond-Rankine-Cycle_Reheat.xls
Cond_extract-cond_reheat



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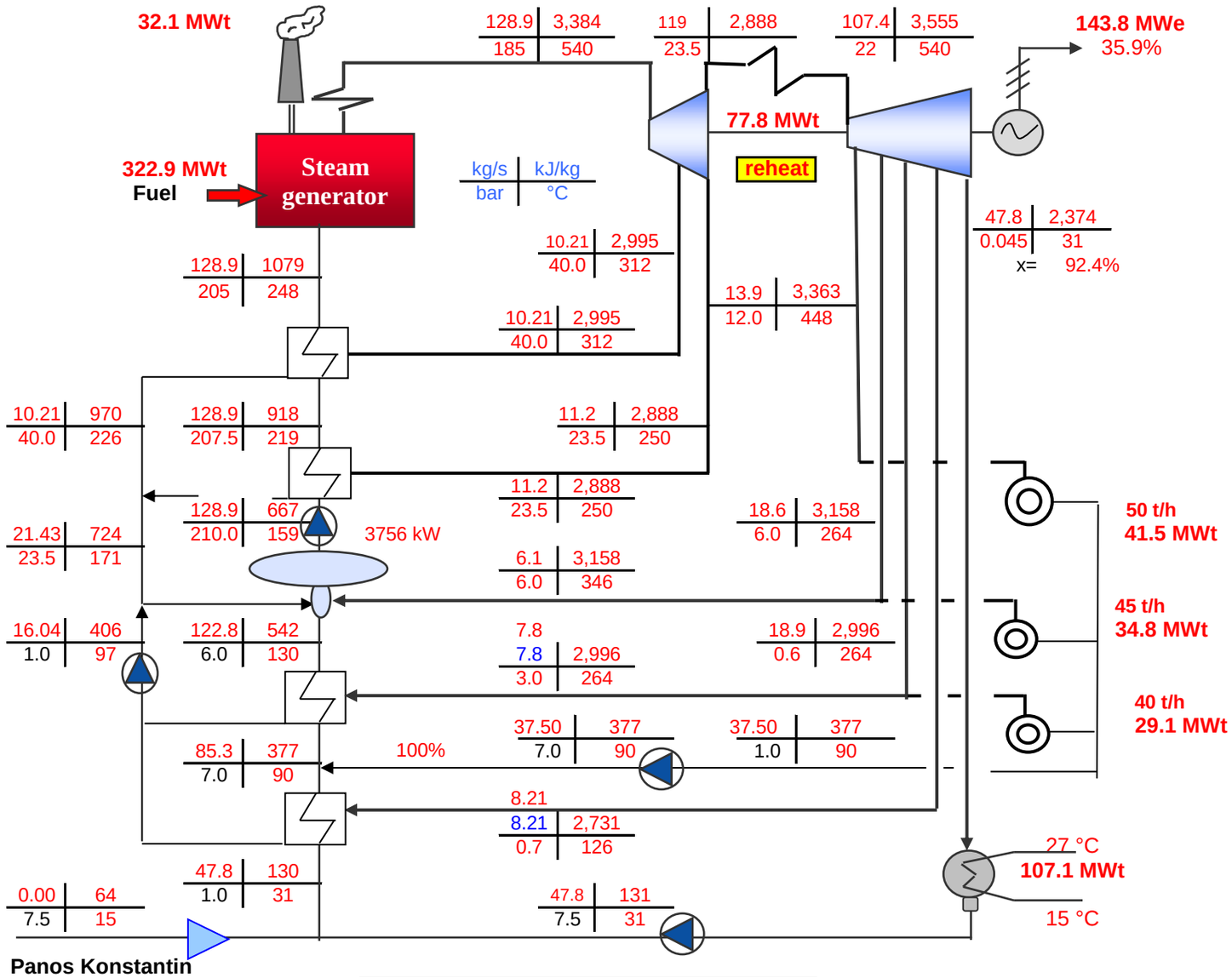
Power output, gross	MW	175.0
Firing rate	MW	400.7
Live steam	MW	322.9
Reheat steam	MW	77.8
Electrical efficiency, gross	%	43.7%
Total efficiency, gross	%	43.7%

2016-07-29

TE-CaseStudy-12_Modelling-Simulation-Extraction-Cond-Rankine-Cycle_Reheat.xls
Cogen_extract-cond_reheat



Power output, gross	MW	143.8
Firing rate	MW	400.7
Live steam	MW	322.9
Reheat steam	MW	77.8
Electrical efficiency, gross	%	35.9%
Total efficiency, gross	%	62.2%

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