Break Out Session

How can we contribute to optimize your steam cycle efficiency?

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Görlitz, 2023-09-12

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Agenda

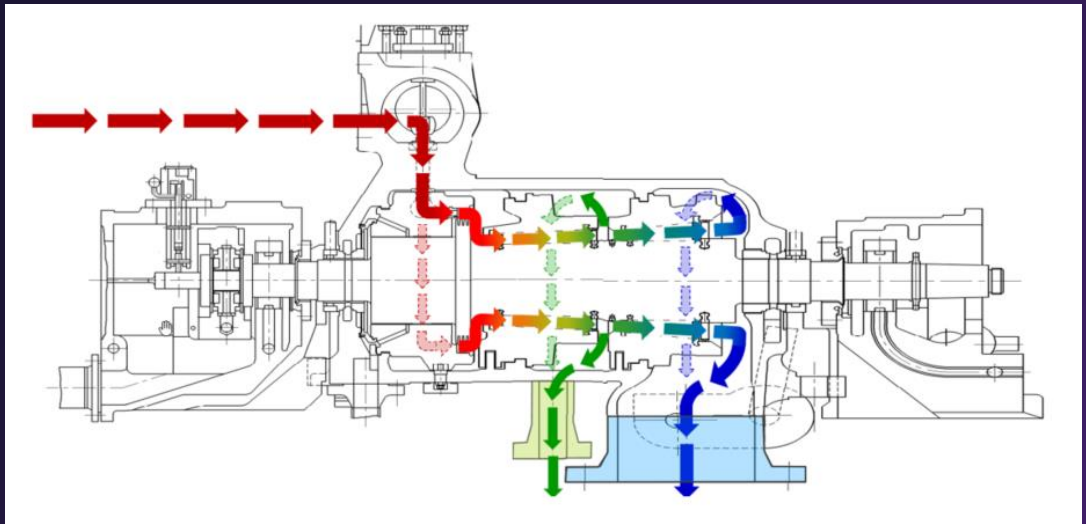
1 Introduction

2 Case study

3 Dialogue / Q&A



How can we contribute to optimize your steam cycle efficiency?



Steam Turbine Revamps focus on optimization of “inner” life of the steam turbine using original plant peripherie.

Typical Applications

Fuel shift
Optimization for new steam parameters

Heat demand
Optimization for changed extraction needs

Plant load
Optimization for changed power requirements

CO_2e reduction



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Case study



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We are, where you are - impacting life!

Turbine efficiency increase by implementing district heating



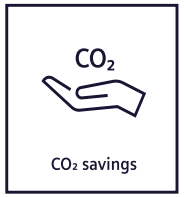
Customer
Pulp&Paper

Location
Austria

Order Year
2022

Application
Generator Drive Turbine





Background

- Customer operates extraction condensing turbine build in 1990
- Extraction steam could not be used for the paper process anymore
- Due to limited swallowing capacity in LP section, more steam could not be utilized

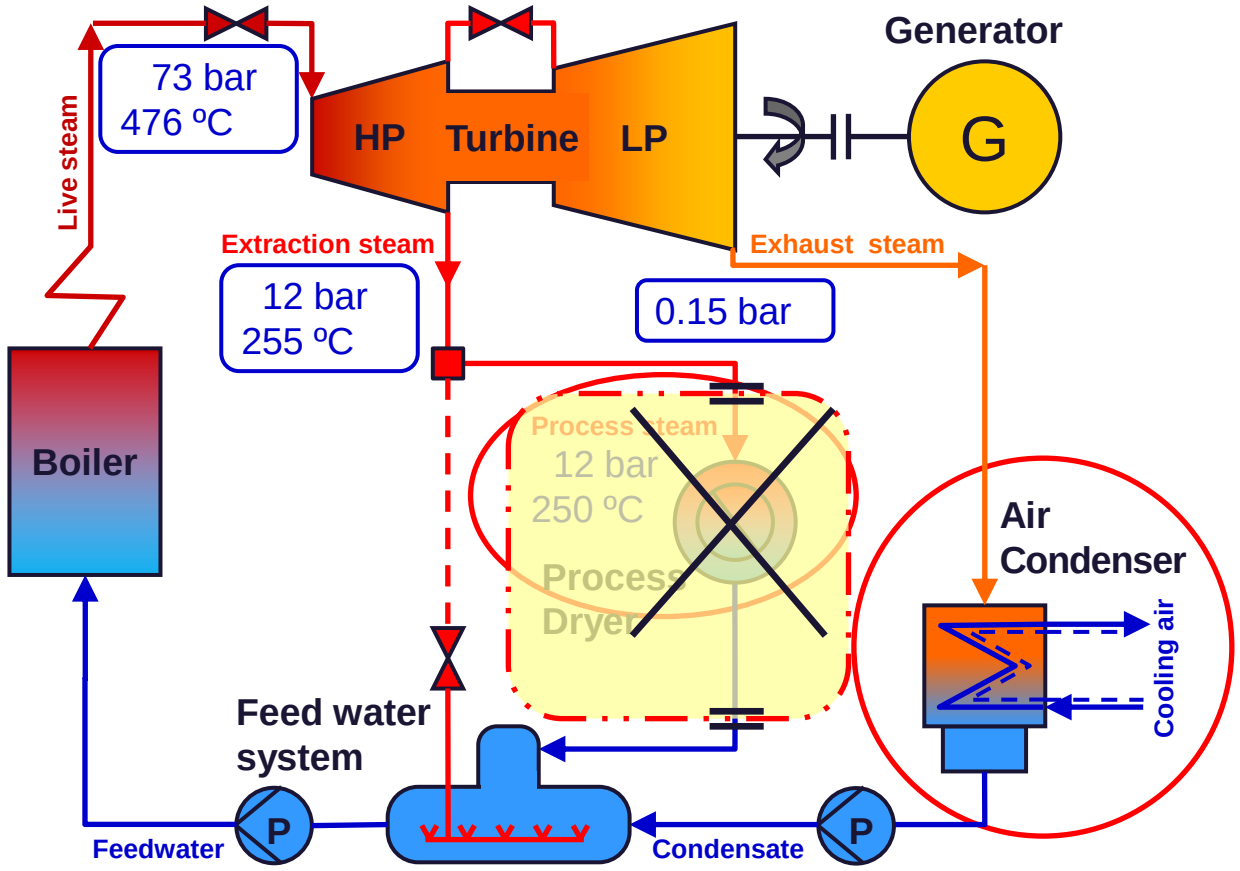
Project starting point

- Less main steam entering the turbine led to a worse efficiency and dramatically electrical power drop of 67%
- Major outage planning of the turbine - initiate feasibility study for modification

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Before

Original design of plant process with dryer



Technical data of original plant design

Original design load of the steam turbine:

Live steam:	~~127.6 t/h~~	44.3 t/h
Extraction steam:	~~82.7 t/h~~	
Exhaust steam:	44.3 t/h	
Electr. Output:	~~19.31 MW~~	6.32 MW

73.0 bar / 476 °C
12.0 bar / 255 °C
0.15 bar / 54 °C

Original design process steam (dryer):

Thermal heat: 50.72 MW

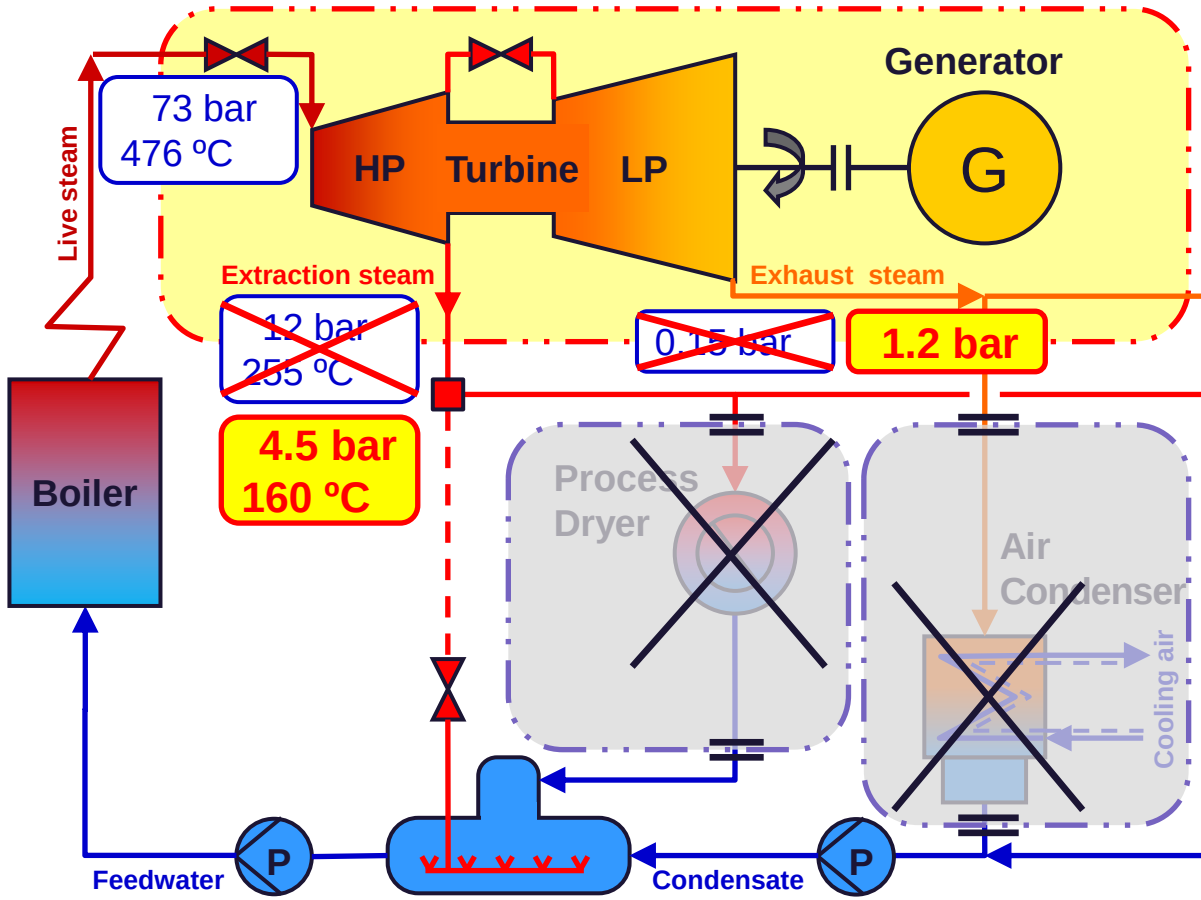
Exhaust heat loss: - 27.25 MW

History of changes in plant process:

- Shut down of the process dryer = no extraction steam
- Limitation of Live steam to blading of LP- capacity
- **Reduction Electrical Output Crash from - 67% !**

After

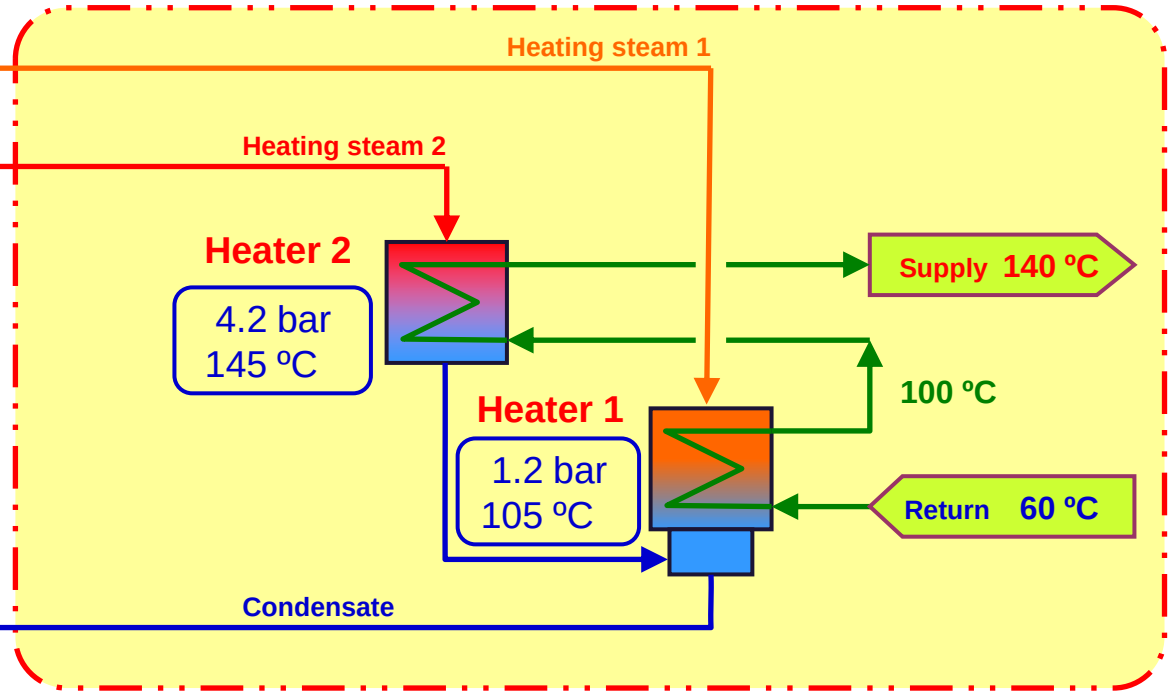
Changes of the plant process for district heating



Optimization of steam turbine & process

Requirements for revamping of the steam turbine:

- **Increasing** of **total efficiency** of the plant process
- based on the **original live steam parameter**



Result

Evaluation District heating	Original design without Revamp	Optimization Turbine & Process
Heat of evaporation (boiler)	**100.31 MW**	**100.31 MW**
Electrical output turbine	**19.31 MW**	**22.16 MW**
Thermal heat utilization	**46.70 MW**	**74.88 MW**
District heating 4.5 bar (extraction)	from 12 bar 46.70 MW	from 4.5 bar 37.71 MW
District heating 1.2 bar (exhaust)	from 0.15 bar not possible	from 1.2 bar 37.17 MW
Thermal heat losses	**-34.30 MW**	**-3.26 MW**
Air condenser (indirect heat loss)	**-27.25 MW**	without condenser
Various process losses	-7.05 MW	-3.26 MW
Total usable energy	**66.01 MW**	**97.04 MW**
Usable portion evaporation heat	**65.81 %**	**96.74 %**
	Increase of economic efficiency:	**+ 30.93 %**

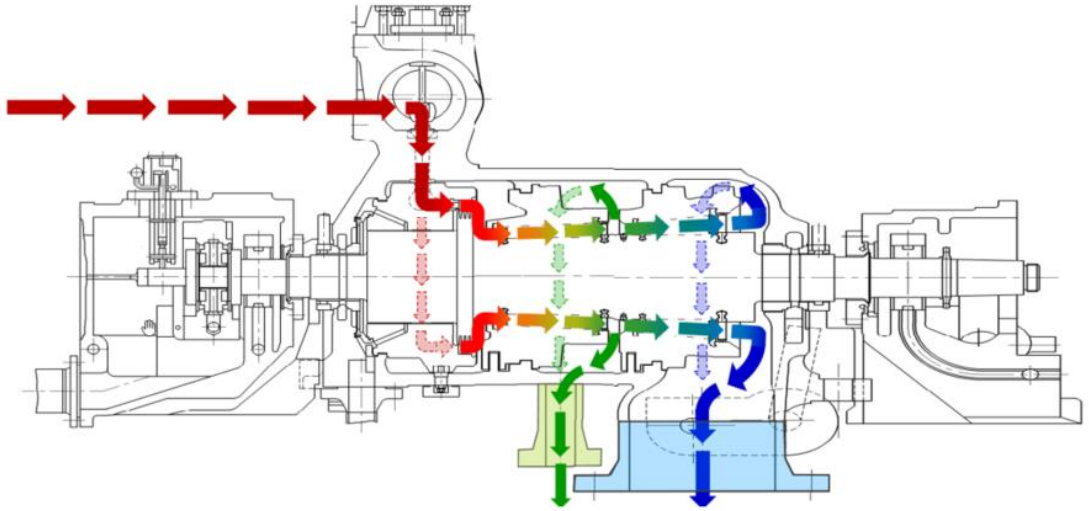
Starting questions -> Do you…

… change steam / process parameters?

…increase/ decrease plant production?

… receive benefits from “green power”?

… experience changed process steam requirements e.g. district heating.?



Introduction

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