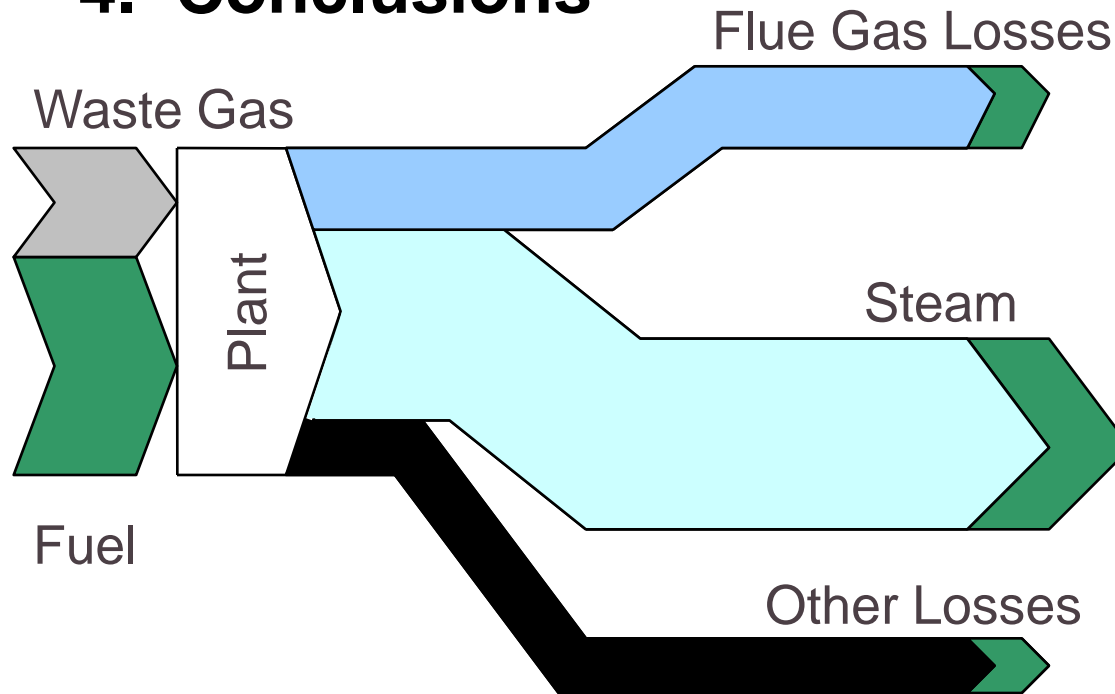
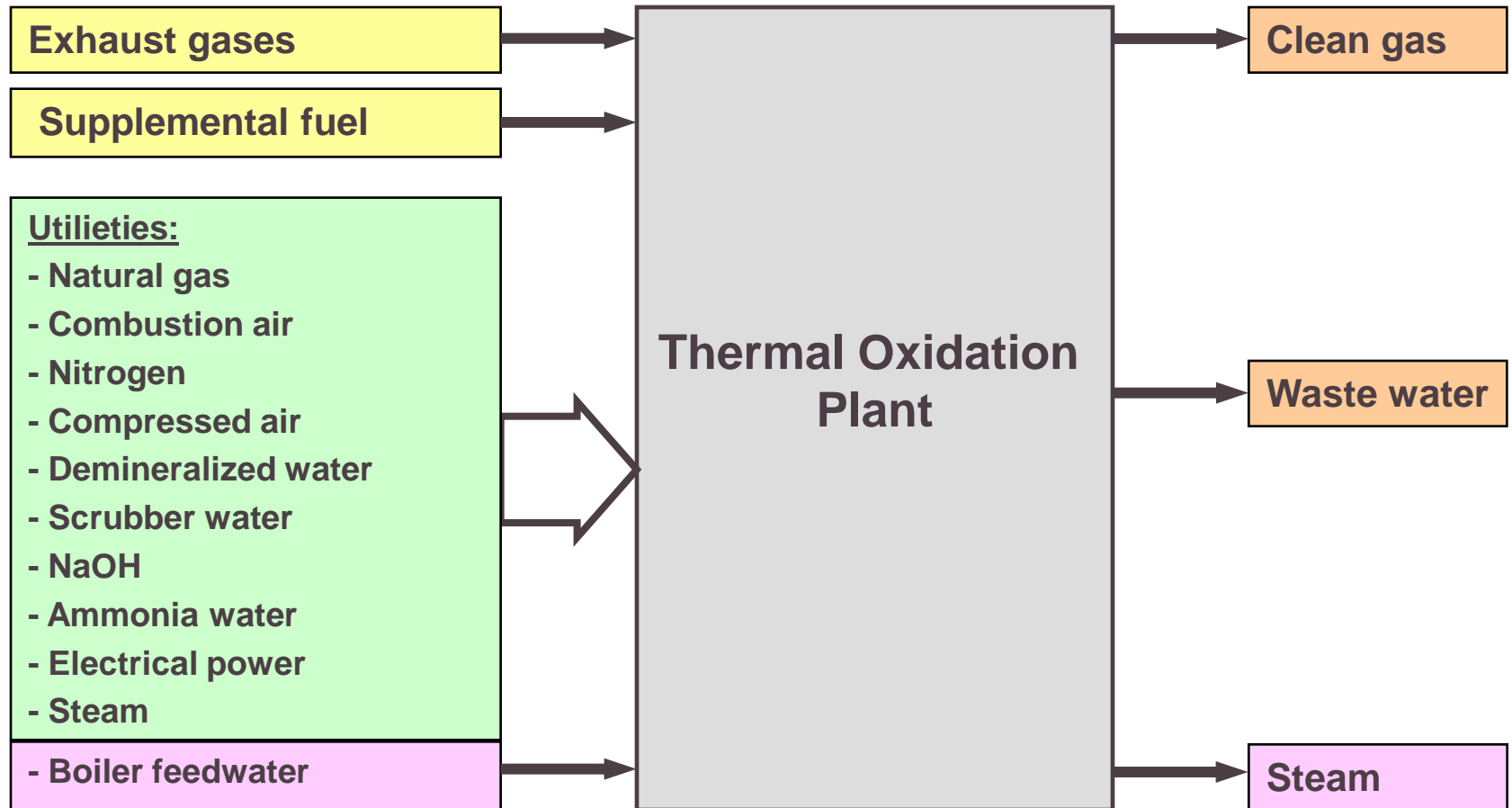

Energy Efficiency of Thermal Waste Gas Oxidation plants

Agenda

1. Introduction
2. Systematic approach
3. Optimazition options
4. Conclusions



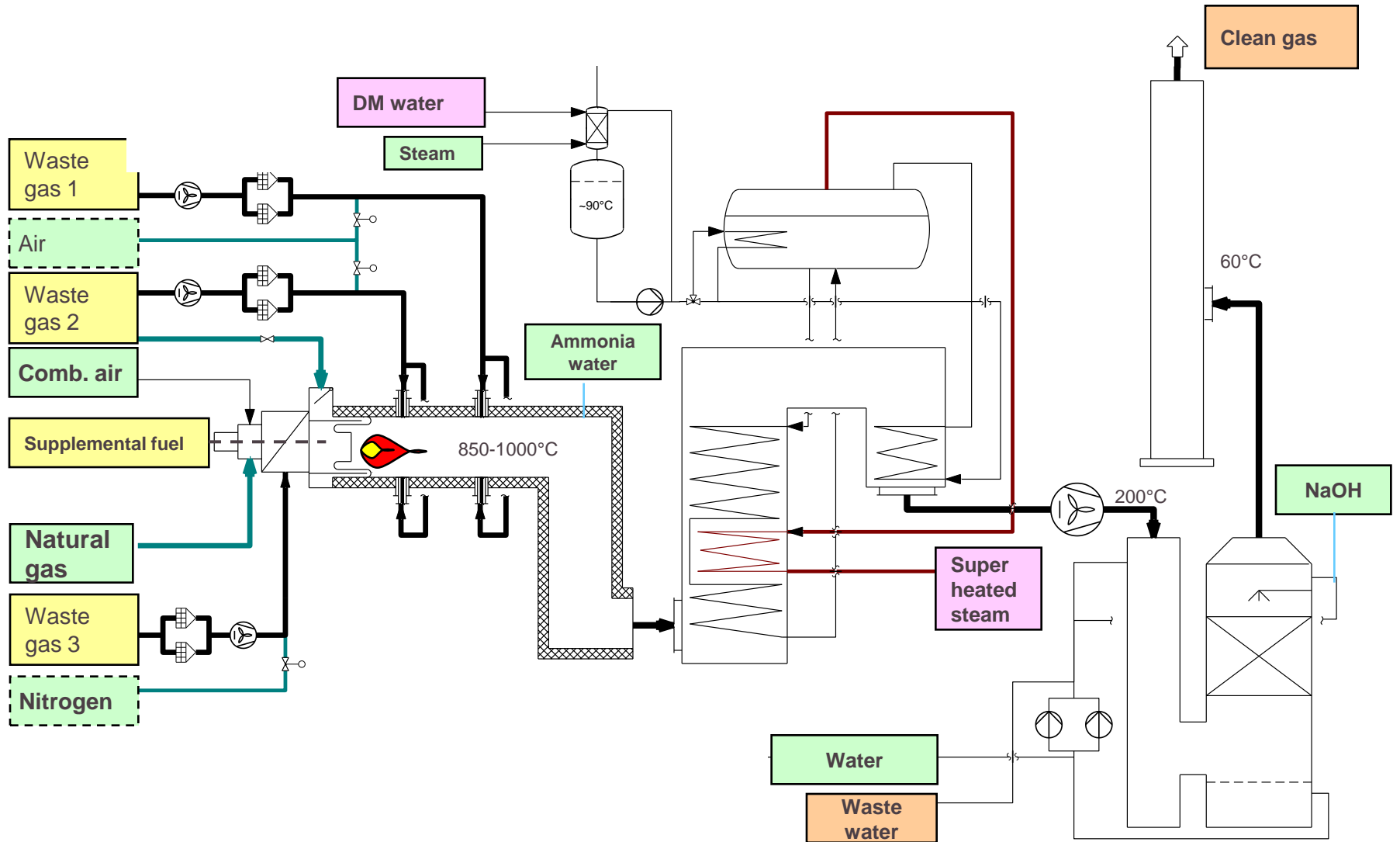
Schematic sketch of a Thermal Oxidation Plant



Target: Efficient disposal solution

⇒ Minimize use of Energy and utilities

Schematic sketch of a Thermal Oxidation Plant



Approach in the energy efficiency check

1. Observation of processes and equipment

- Functionings and specifications of equipment as well as processes requirements should be clarified

2. Check and analysis of actual operation situation

- Define the actual operation load(min, norm, max) for representative period (i.e. summer/winter)
- Comparison of design and experience data/actual load data
- Process calculation and analysis

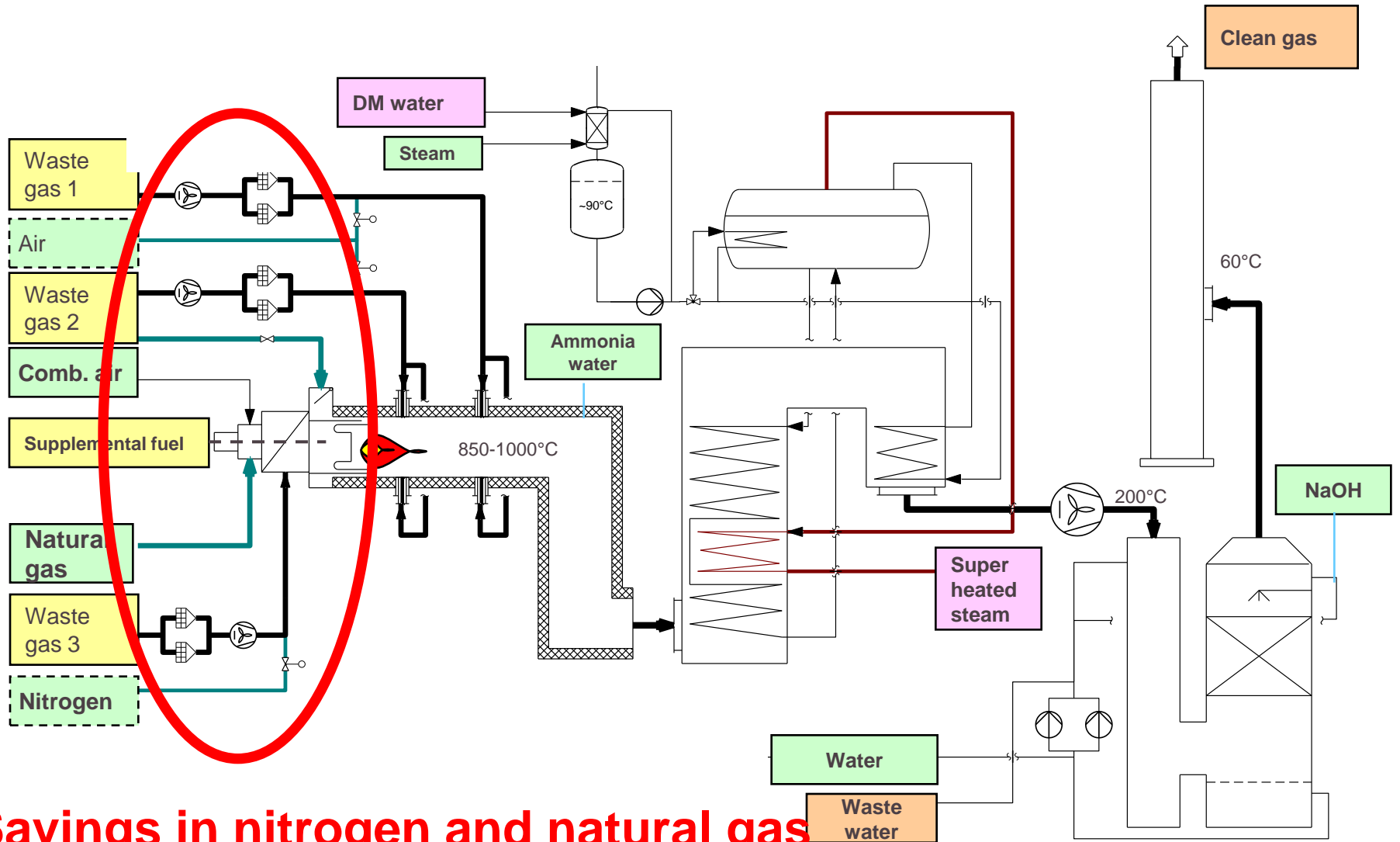
3. Identification and evaluation of optimization options

- Estimation of saving potentials
- Estimation of invest costs and payback period

4. Implementation

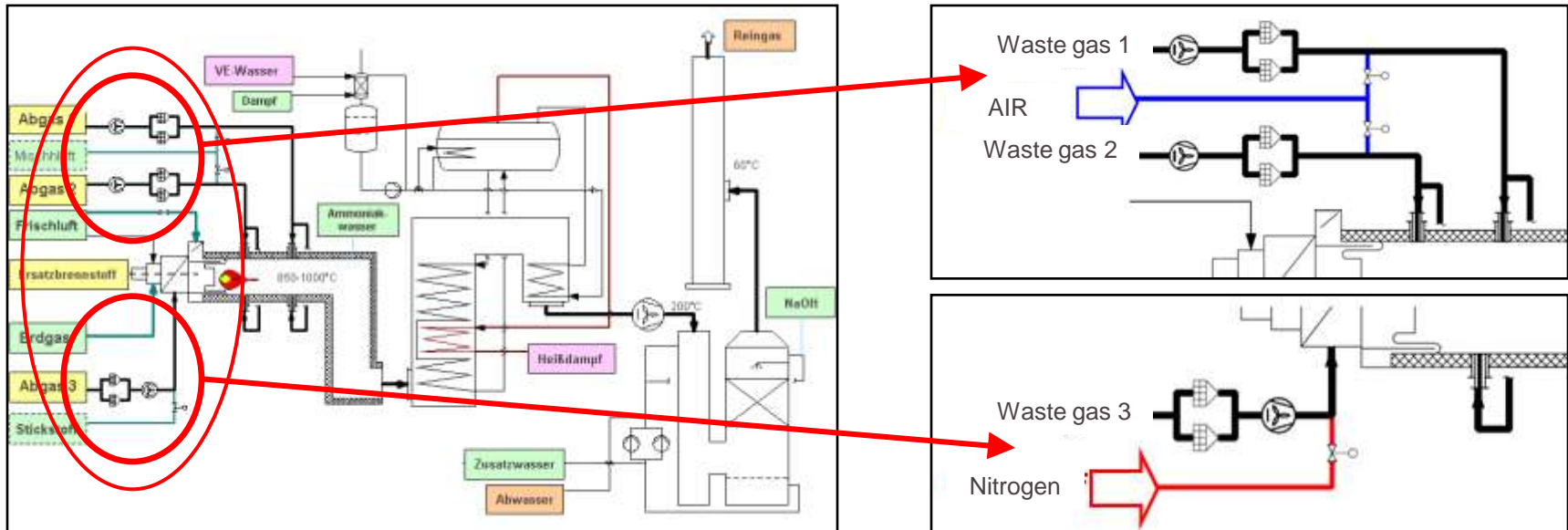
- Detailed studies, Implementation, check

Optimization options: Waste gas connection



Savings in nitrogen and natural gas

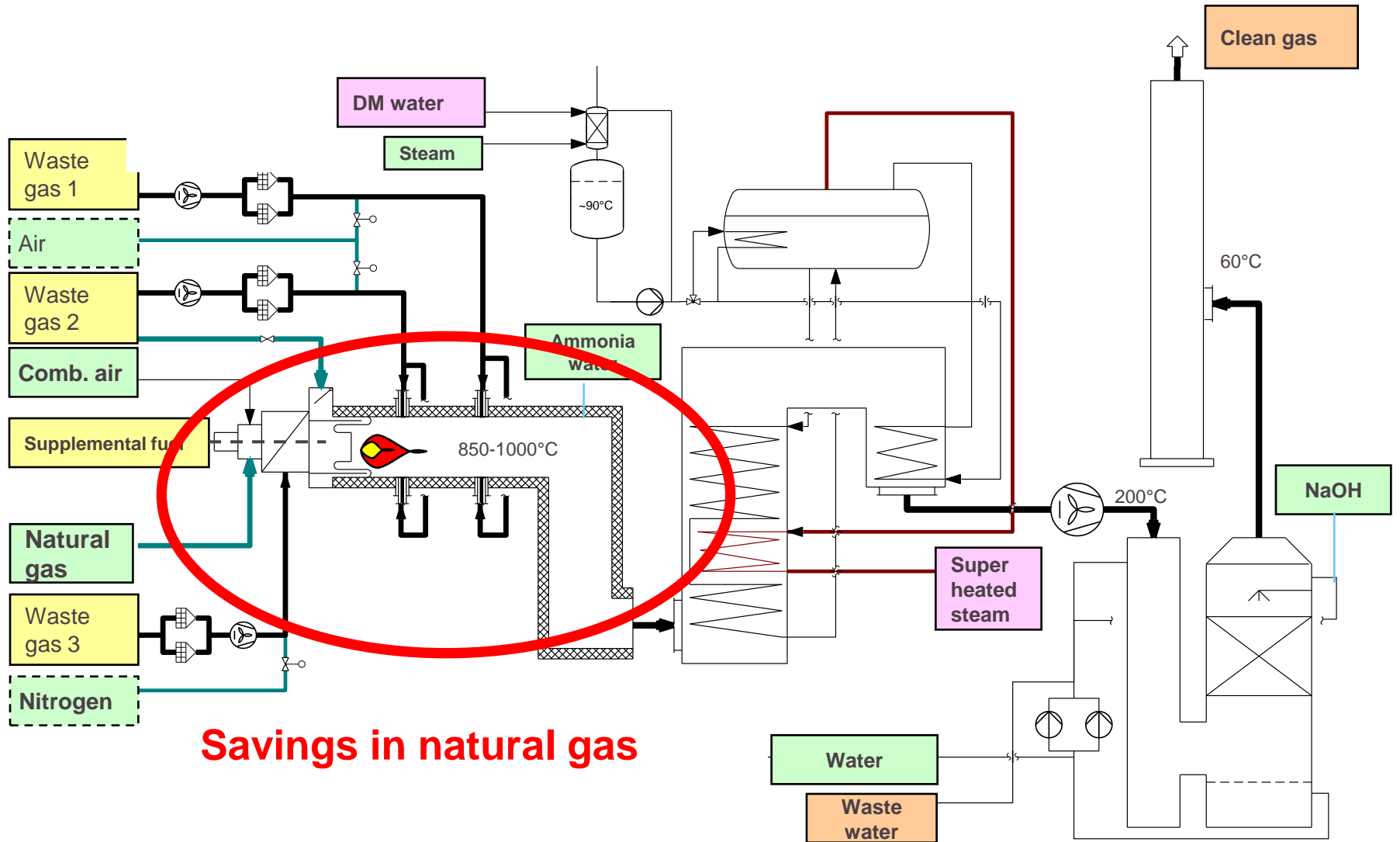
Optimization options : Waste gas connection



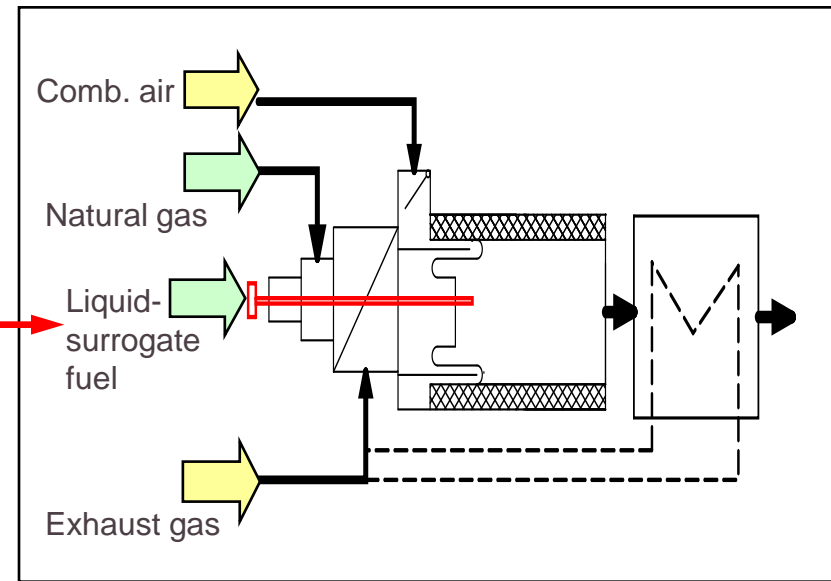
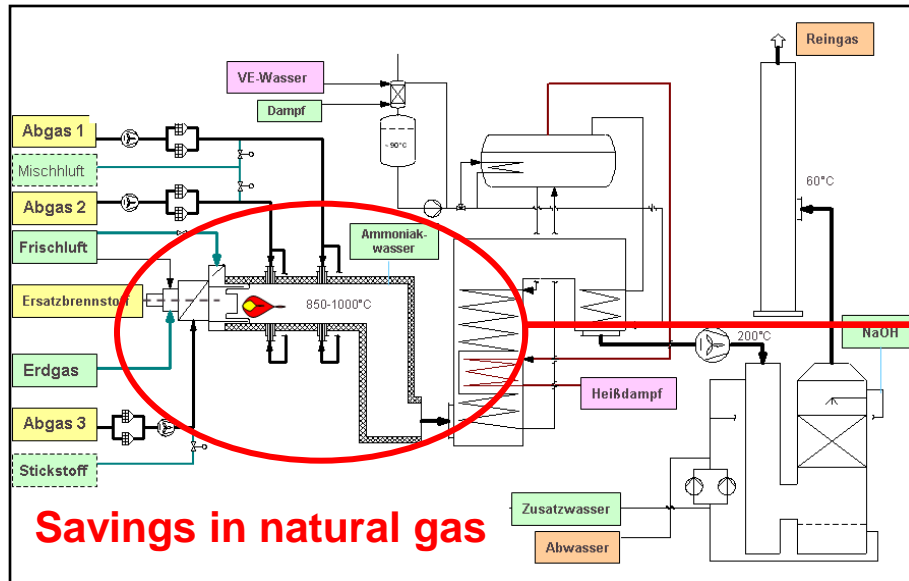
Savings: Nitrogen and natural gas

- Optimization of waste gas ejector for dynamic flame arrester (after checking of maximum/ minimum waste gas quantity)
- Injection of natural gas (if exhaust gas contents no O₂)
- Use of regulation valves instead of On/Off-Valves

Optimization options: Combustion Chamber



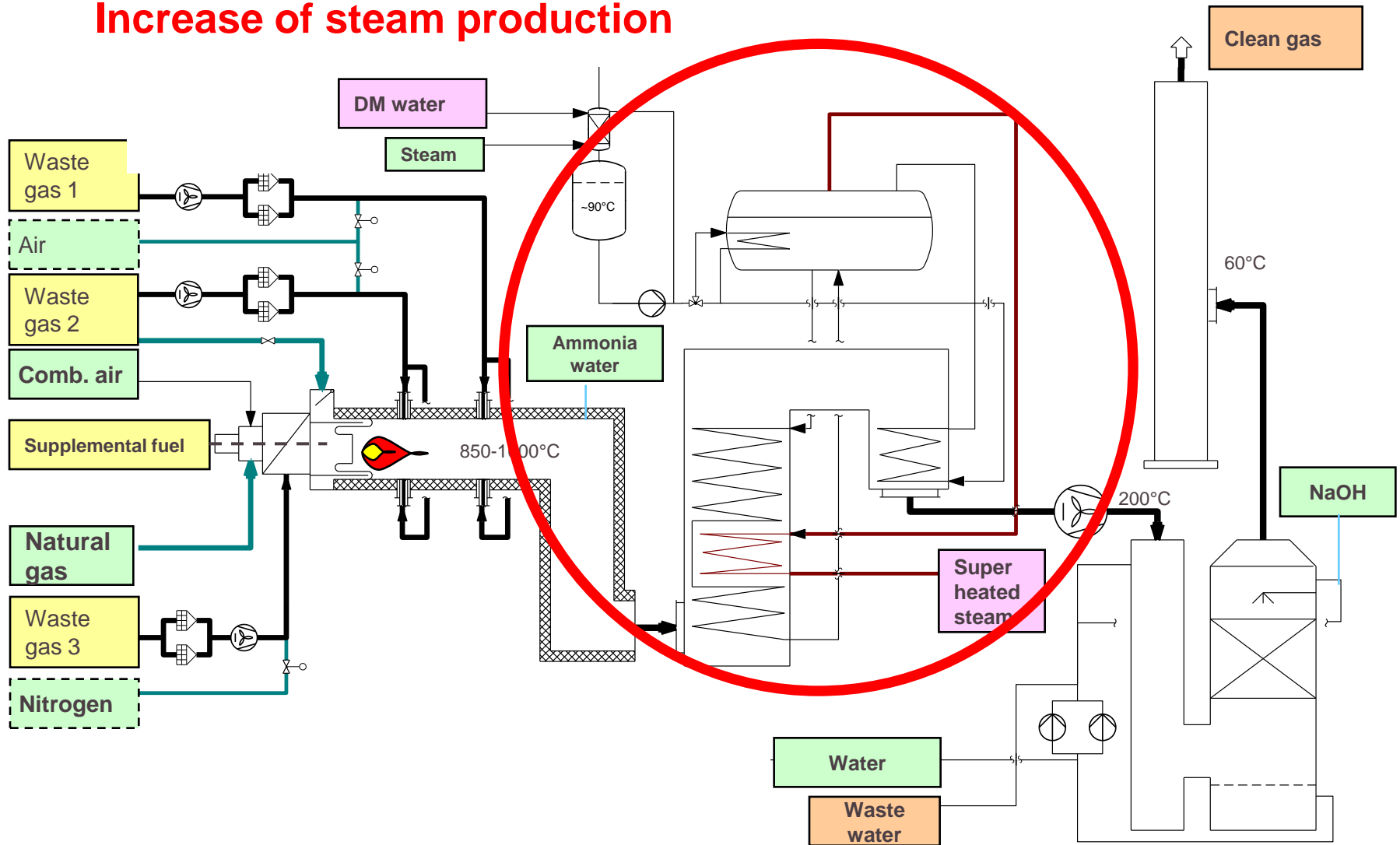
Optimization options: Combustion Chamber



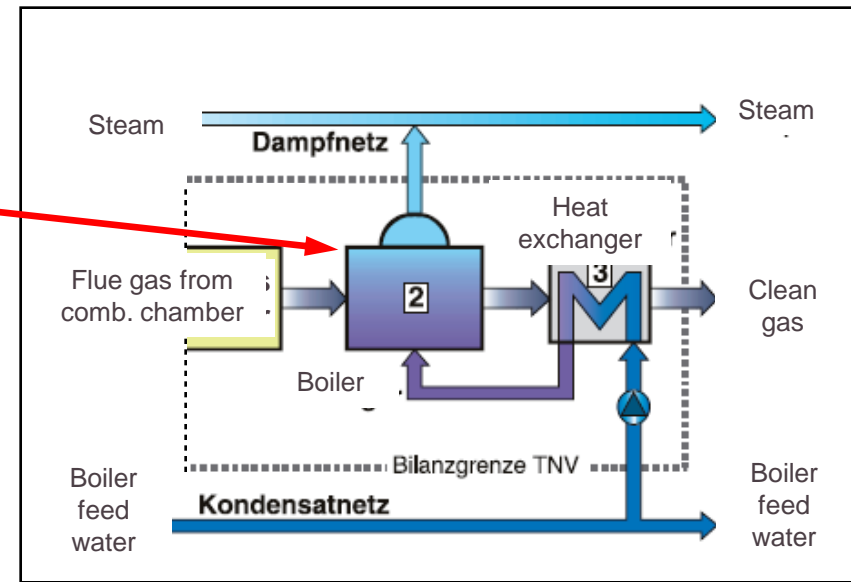
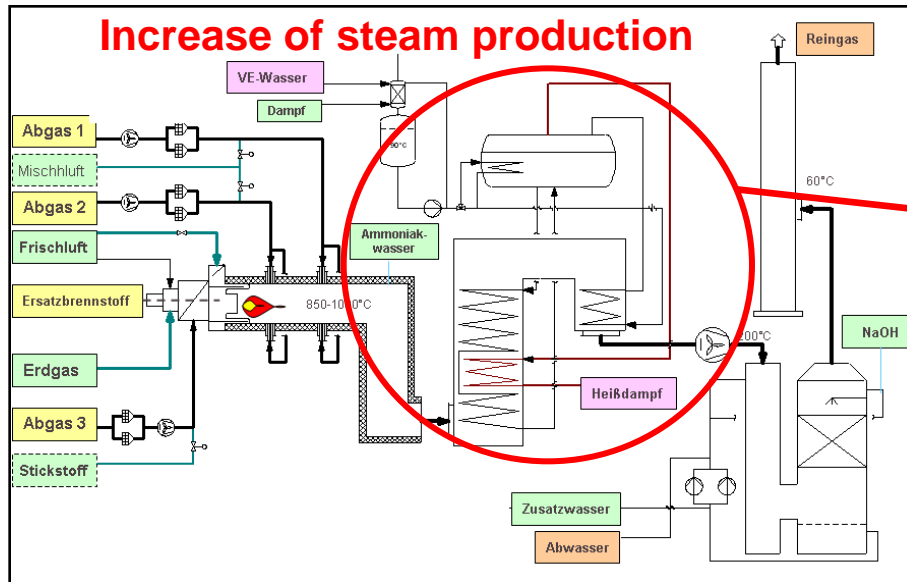
- Reduction of fluegas volume
- Proper insulation
- Preheating of combustion air and/or exhaust gases
- Reduction of fluegasvolume through concentration
- Use of liquid residues with high heat rates (contaminated solvents, alcohols,etc)

Optimization options: Steam production

Increase of steam production

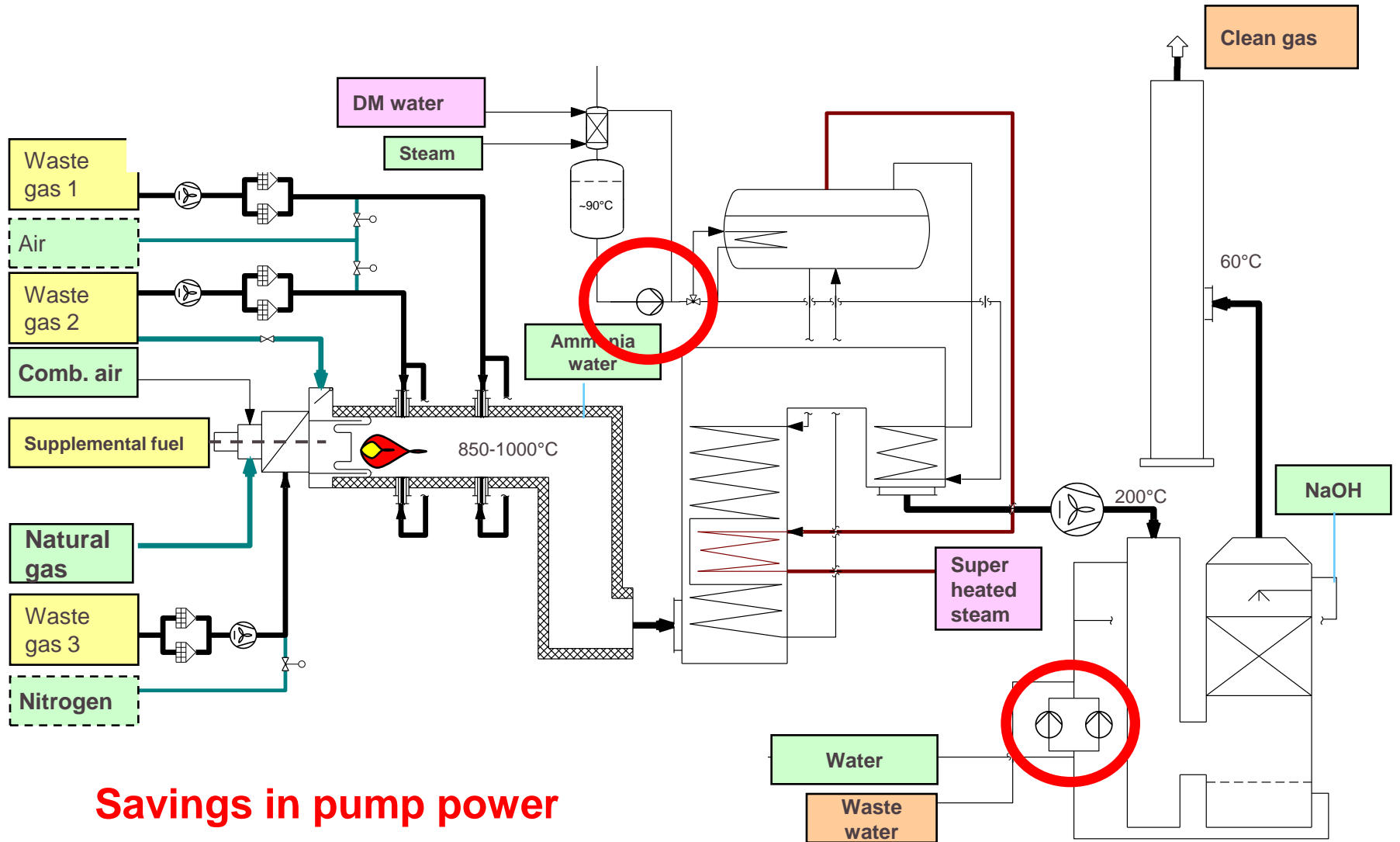


Optimization options: Steam production



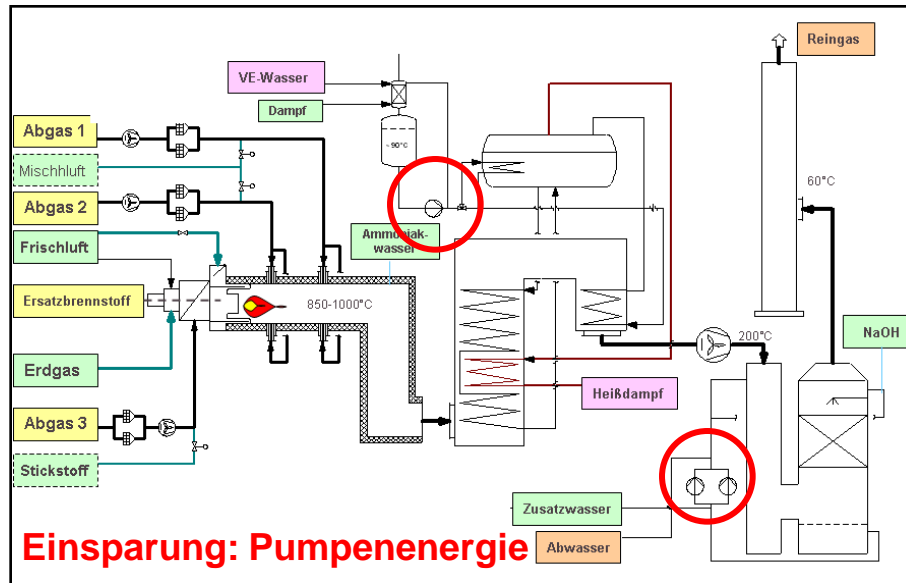
- Preheating of boiler water (through economiser or use of external heat sources)
- Continuous cleaning and maintenance of heat exchange surface so that flue gas outlet temperature will decrease
- Optimization of deoxidisation system for boiler water conditioning (Reduce steam demand for deoxidisation)

Optimization options: Pumps

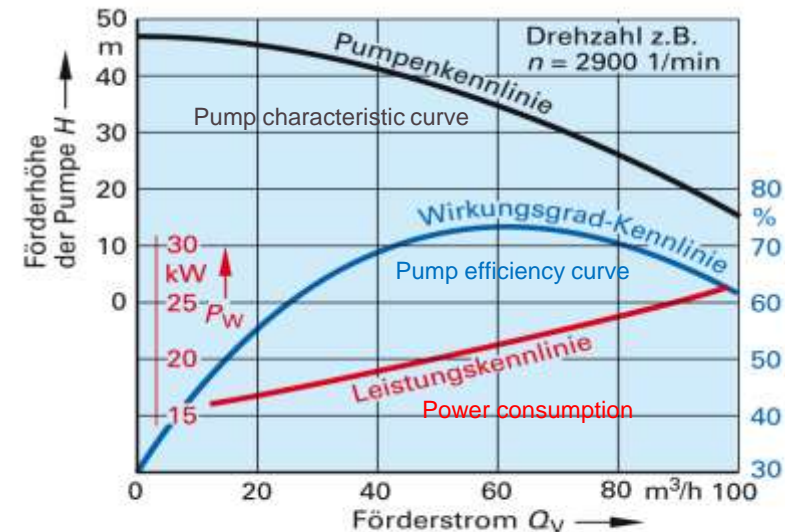
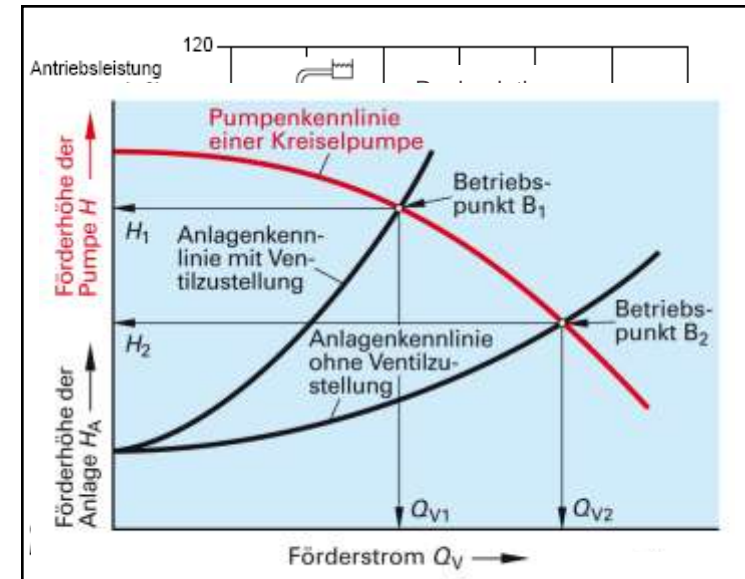


Savings in pump power

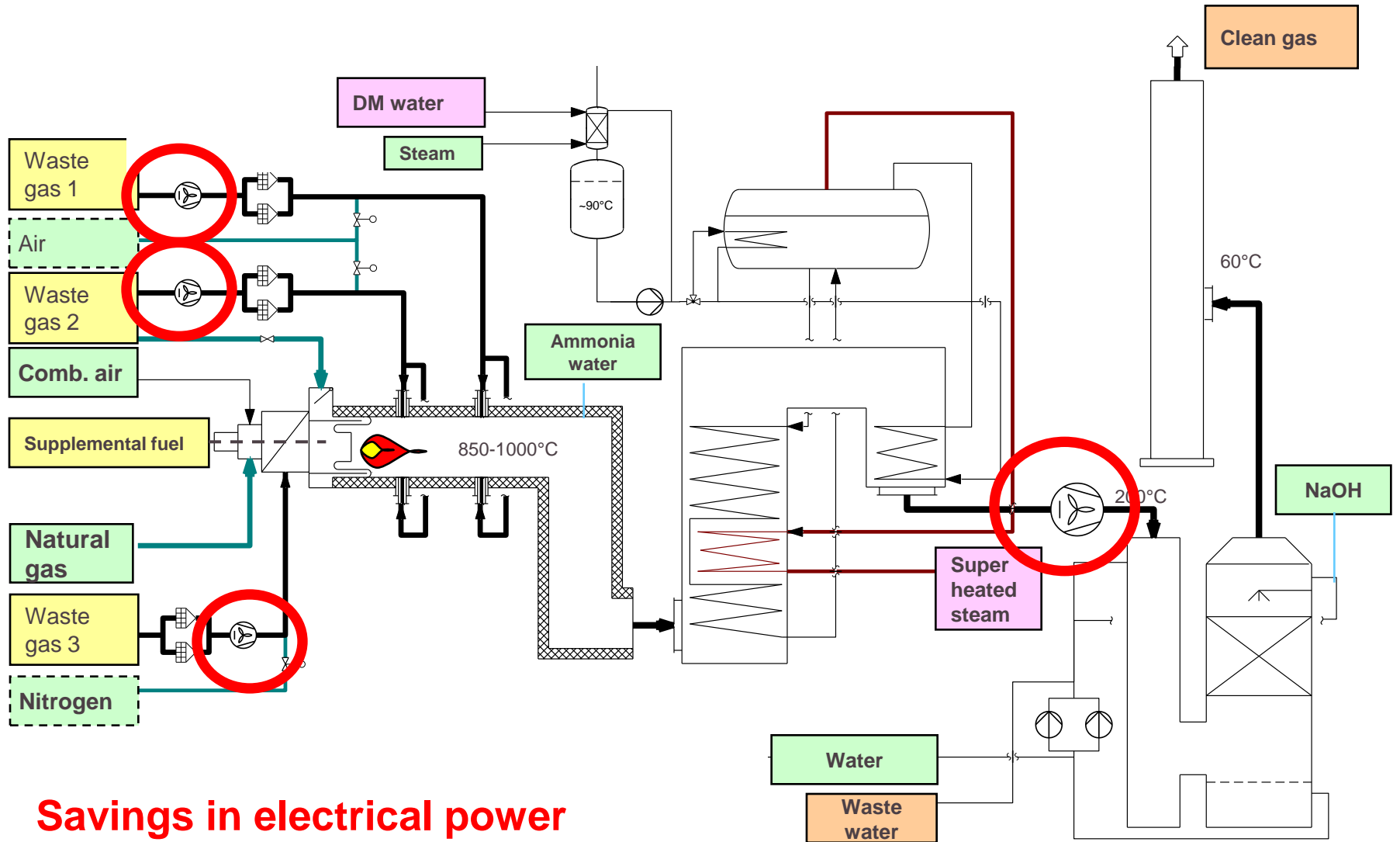
Optimization options: Pumps



- Operation of pumps at maximum efficiency
- Type of controlling:
Use of frequency converter on pumps which operating with various flow rates and pump pressures
- Purchase new equipment and/or motors with higher efficient factors

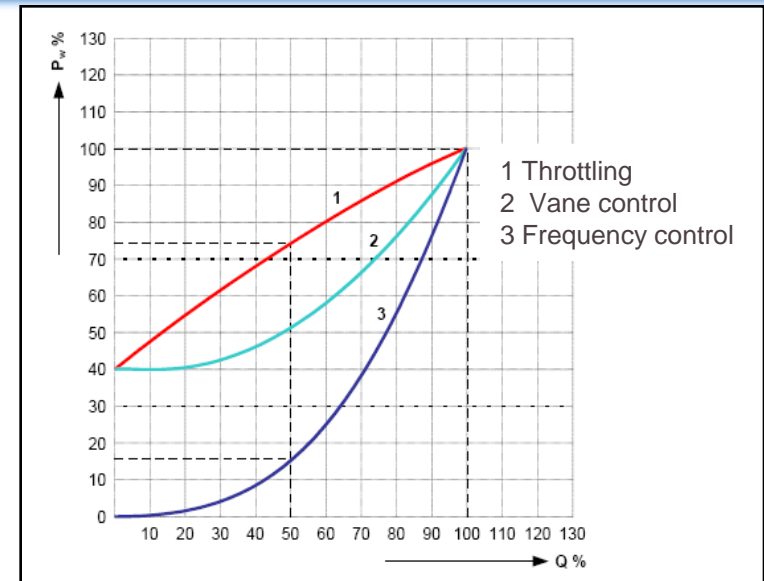
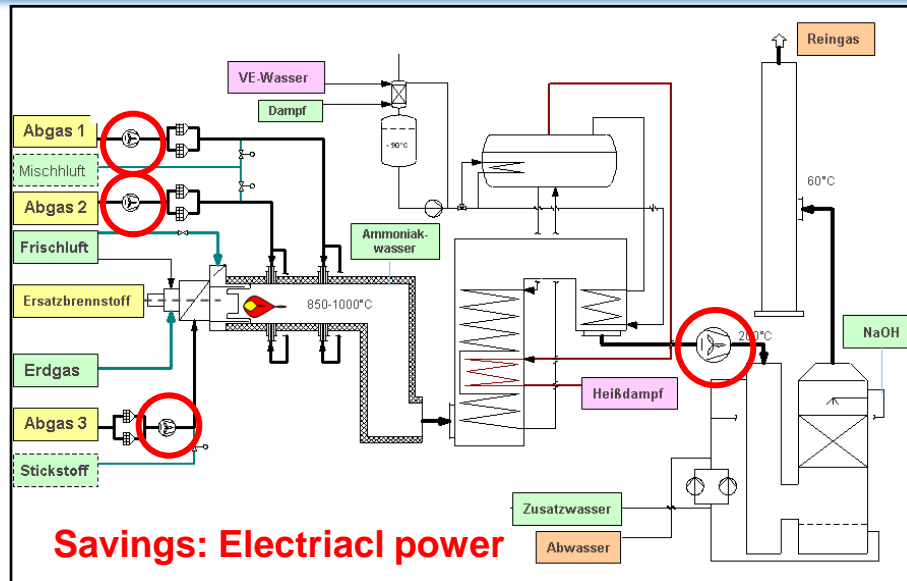


Optimization options: Fans



Savings in electrical power

Optimization options: Fans



- Powertransmission: fixed or flexible 1:1 coupling
- Controlling: Use of frequent converter or vane controllers if gas flow varies
- Modification of ventilator placement in process
- Continuous maintenance and cleaning of the impeller
- Purchase new equipment and/or motors with higher efficient factors

Energy efficient Check: Conclusion

Saving potential at waste gas connection/combustion chamber

- ⇒ Adjust injectors nozzles to requirements
- ⇒ Use of supplemental fuel (liquid residues)

Saving potential in steam production

- ⇒ Heat utilization as much as possible
- ⇒ Focus behind the boundaries (Use of steam, required steam pressure, etc.)

Cross media effects

- ⇒ Possibility of certification for DIN ISO 16001 (EnMS)
- ⇒ Reduction of CO₂ emissions
- ⇒ Possibility to register under Kyoto protocol as CDM project



Thanks for your attention!