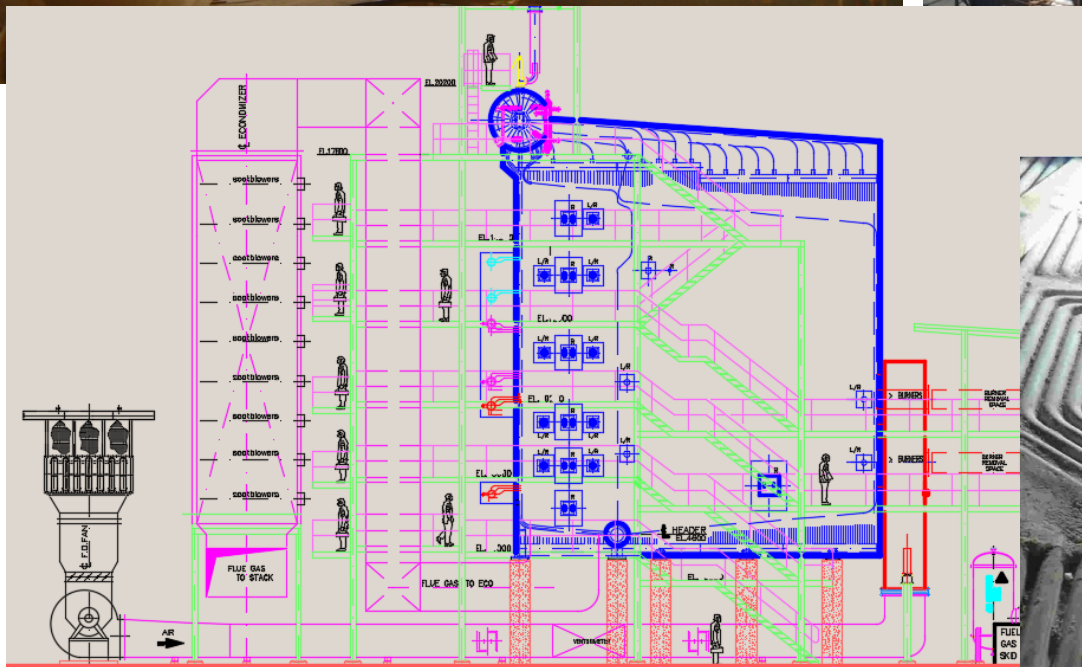
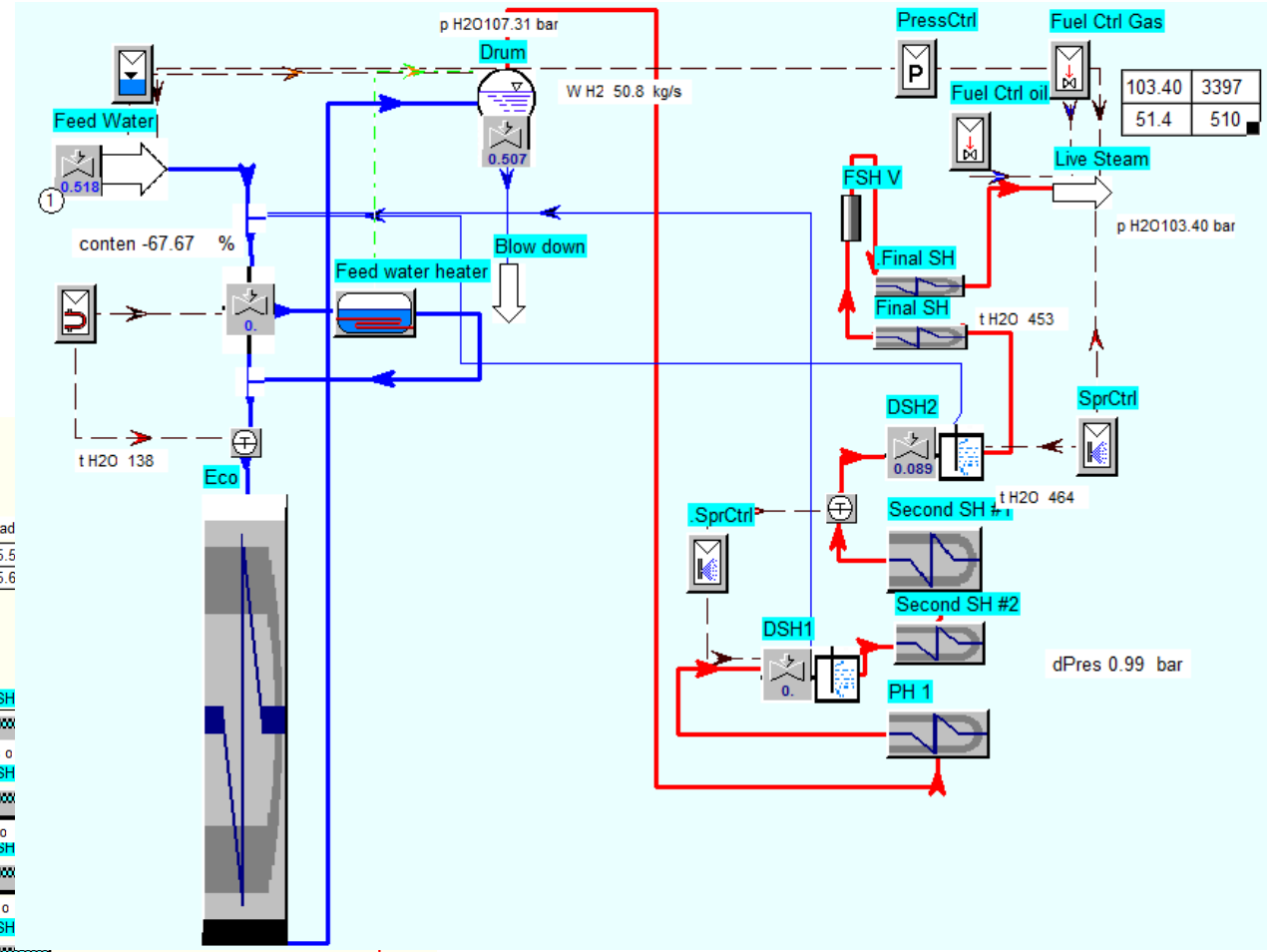
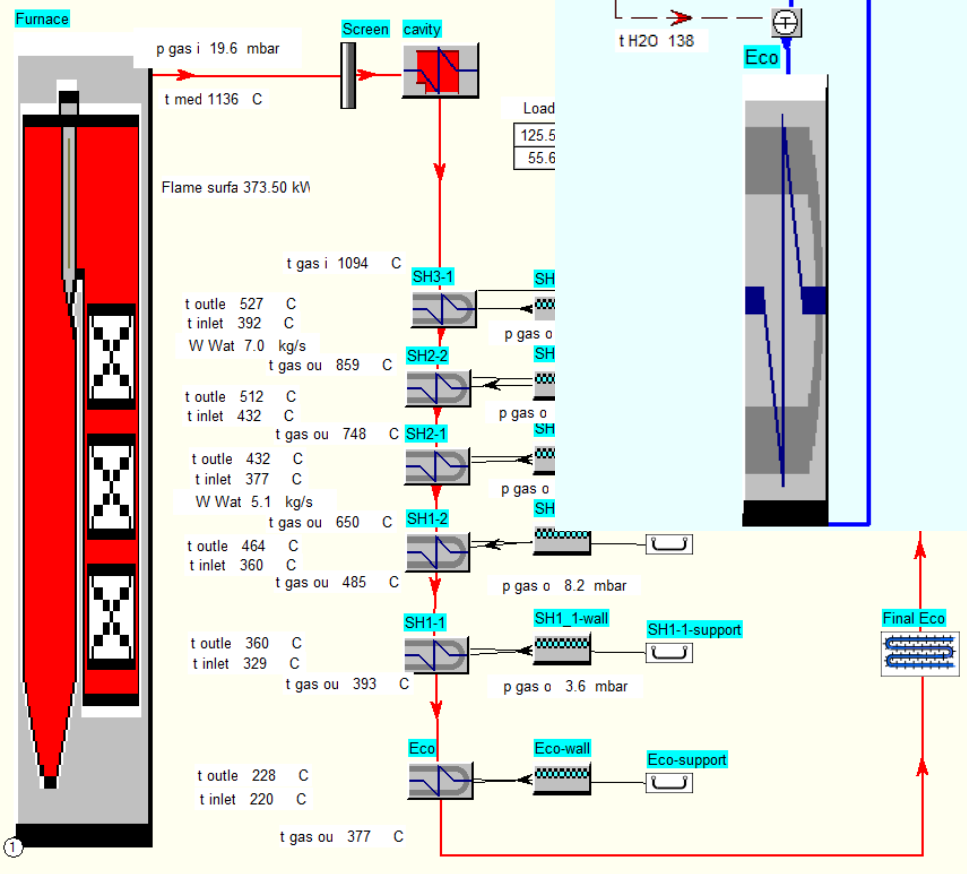


# Example Mono Drum Water Tube Boiler Oil / Gas with **Power Plant Simulator & Designer**



# Example model in Power Plant Simulator & Designer

W Air 77.1 kg/s  
 Gfuel 4.2 kg/s  
 W gas 81.3 kg/s  
 GfuelV 0 nm<sup>3</sup>/h  
 GfuelV 20276 nm<sup>3</sup>/h  
 V Air 217967 nm<sup>3</sup>/h  
 V\_med 238014 nm<sup>3</sup>/h  
  
 W nom 55.6 kg/s  
 percQI 0.22 %  
 flue q 8.96 %  
 loss unburn 0.00 %  
 effic 90.82 %  
 Air excess 1.15 -  
 CO2 8.05 % vol  
 SO2 0.00 % vol  
 N2 69.09 % vol  
 AR 0.81 % vol  
 O2 2.40 % vol  
 H2O 19.65 % vol



|        |      |
|--------|------|
| 103.40 | 3397 |
| 51.4   | 510  |

## Example output heat balance

|                           |        |       |  |
|---------------------------|--------|-------|--|
| efficiency heat loss meth | 96.46  | %     | Efficiency according to the heat loss method based LHV   |
| efficiency input output   | 96.46  | %     | Efficiency according input output method based LHV       |
| Qoutput                   | 144775 | kW    | Heat output water/steam                                  |
| Qinput                    | 150082 | kW    | Heat input fuel/flue gas                                 |
| Q_Nom                     | 144700 | kW    | Nominal heat power                                       |
| Qfuel                     | 0      | kJ/kg | Caloric value (available fuel heat power per 1kg)        |
| CalcGfuel mix             | 2.0    | kg/s  | Fuel weight flow mix incl. losses                        |
| flue gas losses LHV       | 3.29   | %     | flue gas losses LHV based                                |
| percQloss                 | 0.24   | %     | Heat loss (radiation and convection) by walls in percent |
| loss unburned carbon      | 0.00   | %     | loss unburned carbon                                     |
| q loss enthalpy slag      | 0.00   | %     | Heat loss due to the enthalpy in the slag                |
| q7                        | 0.00   | %     | part Heat loss with exit ash and other losses            |
| Qloss_all                 | 5307   | kW    | Total heat losses  |
| Q heat loss FG LHV        | 4940   | kW    | Heat losses flue gas LHV based                           |
| Q3                        | 0      | kW    | Heat power losses uncomplete burning (CO CH etc)         |
| Q4                        | 0      | kW    | Heat power losses unburned fuel                          |
| Qloss                     | 368    | kW    | Heat loss (radiation+ convection) by walls               |

Example output final SH (there are also much more data like tube wall temperatures)

|                        |           |                      |  |
|------------------------|-----------|----------------------|--|
| Q                      | 1843      | kW                   | Heat power                                     |
| A                      | 36.97     | m <sup>2</sup>       | Heating surface                                |
| MTD                    | 584.72    | K                    | Mean temperature difference                    |
| U                      | 86.15     | W/m <sup>2</sup> K   | Overall heat transfer coefficient              |
| h outside conv         | 57.97     | W/m <sup>2</sup> K   | outside convection heat transfer coefficient   |
| h inside               | 2577.40   | W/m <sup>2</sup> K   | Heat transfer coefficient (inside tubes)       |
| h GasRad               | 33.09     | W/m <sup>2</sup> K   | Gas side radiation heat transfer coefficient   |
| dPressGasCirc          | 0.0       | mbar                 | Pressure drop in gas circuit                   |
| dP H2O                 | 0.22      | bar                  | Pressure drop of medium                        |
| velocity outside tubes | 9.12      | m/s                  | velocity outside tubes                         |
| rW_Gas                 | 2.25      | kg/m <sup>2</sup> ·s | Flue gases mass speed                          |
| G                      | 665.61    | kg/m <sup>2</sup> ·s | Mass flux                                      |
| Re_FGas                | 3230.52   | -                    | Reynolds number                                |
| Re                     | 812979.98 | -                    | Reynolds number                                |
| NumTubes               | 78.000    | -                    | Number of parallel tubes                       |
| d_i                    | 35.5      | mm                   | Inside diameter of tube                        |
| mean beam length       | 306.15    | mm                   | mean beam length (Thickness of emission layer) |
| A_outsideTubes         | 17.10     | m <sup>2</sup>       | Free cross section area outside tubes          |
| A_insideTube           | 0.08      | m <sup>2</sup>       | Free crosssection area inside tubes            |

- Water tube boilers mono drum and bi drum boilers
- D- Type boilers
- Real natural circulation calculation with 2-Phase flow, void fraction, 2-Phase flow factor
- State of the art furnace calculation
- Multiple superheaters and reheaters with spray cooling / drum cooler / condensate spray cooler
- Hot water water tube boilers
- Air preheaters possible
- Flue gas condensing possible
- Stoker fired boilers possible (chain grate, pusher grates, pin hole grate)
- Efficiency calculation according EN 12953 and ASME PTC 4
- More features needed? Asks Christian Daublebsky von Eichhain cdve@ked.de