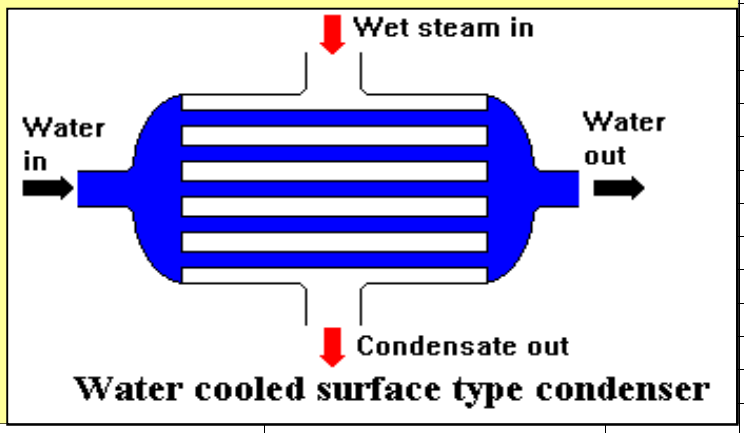
This document shows how Thermo Utilities, MS Excel Add-ins can be used for condenser design.
A surface condenser is required to deal with 15 000 kg/h wet steam. Wet steam temperature is 37 C and enters the condenser with 0.95 quality (dryness fraction is 0.95). The water used for cooling has the following data:
-inlet pressure 1.20 bar, inlet temperature 7 C
-outlet pressure 1.013 bar, outlet temperature 22 C
Calculate the flow rate of cooling water and tube surface of the condenser. Assume that the cooling water velocity through tubes is 1.5 m/s



Water cooled surface type condenser

Inputs		Units	Error ?
Wet steam inlet temperature	37	C	
Steam quality	0.95		
Cooling water inlet temperature	7	C	
Cooling water inlet pressure	1.2	bar	
Cooling water outlet temperature	22	C	
Cooling water outlet pressure	1.013	bar	
Steam mass flow	15000	kg/h	
Cooling water speed	1.5	m/s	
Outputs			
Wet steam pressure	0.06274	bar	
Enthalpy of steam at inlet	2448.28	kJ/kg	
Enthropy of condensate	154.92	kJ/kg	
Rejected heat/hour	34400440.44	kJ/h	
Rejected heat/second	9555.68	kW	
Enthalpy of water at inlet	29.53	kJ/kg	
Enthalpy of water at outlet	92.32	kJ/kg	
Water mass flow	547848.07	kg/h	

The overall heat tranfer coefficient can be calculated according to BEAMA or HEI standards.
BEAMA : British Electrical and Allied Manufacturers Association
BEAMA publication on the recomended practice for design of surface type steam condenser
HEI : Heat Exchanger Institute
HEI standards for steam surface condensers

According to BEAMA:

$$U = 2.15\ v^{0.5}(0.7586+0.0135\ T\ -0.0001\ T^2)$$

According to HEA:

$$U = 2.70\ v^{0.5}(0.5707+0.0274\ T\ -0.00036\ T^2)$$

v : Water speed in tubes

T : Condenser temperature [C]
U : Overall heat transfer coefficient [kW/m^2 K]

Outputs		Unit	
Heat transfer coeff.(BEAMA)	2.95235	kW/m2,K	
Logarithmic mean temp. diff.	49.83	degree K	
Required area	64.96	m2	

If we use the less conservative HEI method we obtain the following:

Outputs		Unit	
Heat transfer coeff.(HEI)	3.60991	kW/m2,K	
Required area	53.12	m2	