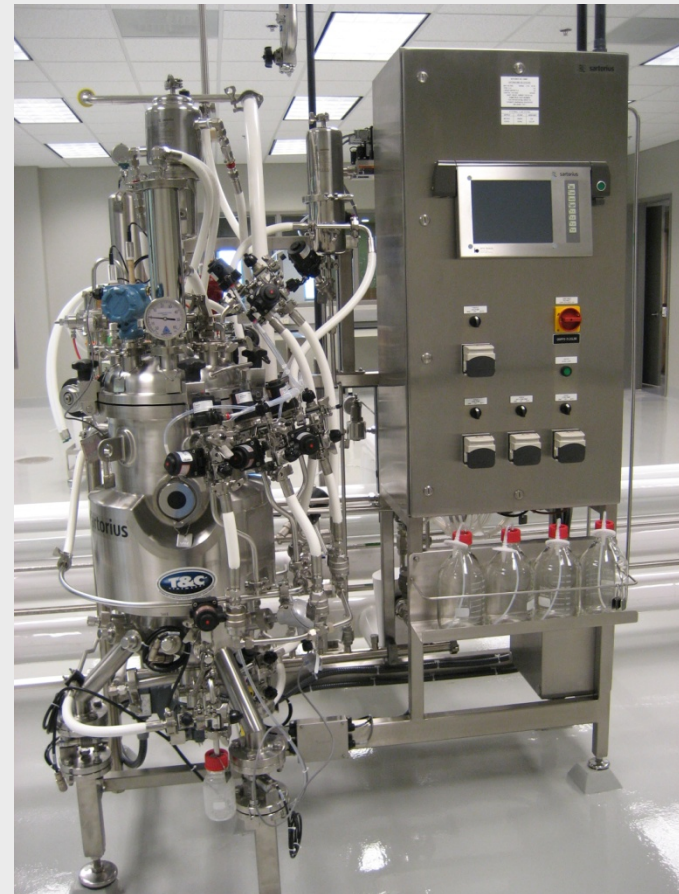


Session #1 Pre-lab introduction

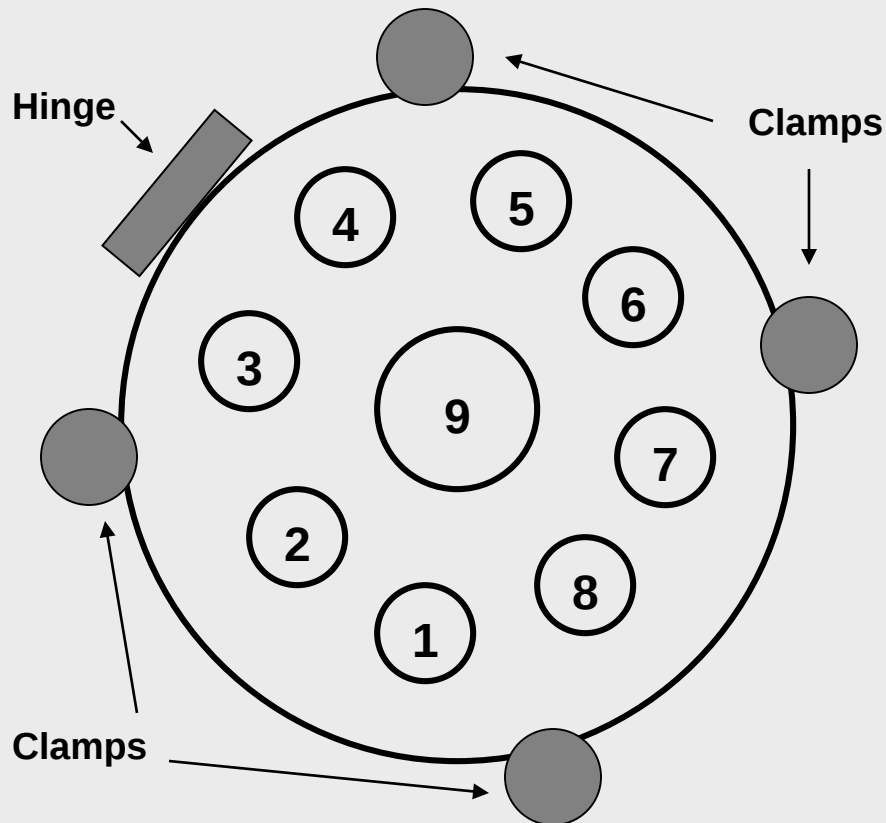
1. **Completion of lab safety checklist**
2. **Examination, identification and labeling of bioreactor components**
3. **Disassembly of head-plate connections**
4. **Opening of head-plate and measurement of bioreactor internals**
5. **Closing of head-plate and re-assembly of head plate connections**
6. **Completion of in-lab exercises for lab report**

Potential hazards

- high temperature
- high pressure gases
- rotating machinery e.g. pumps
- chemicals e.g. clean reagents (pregnant→no)
- biohazards



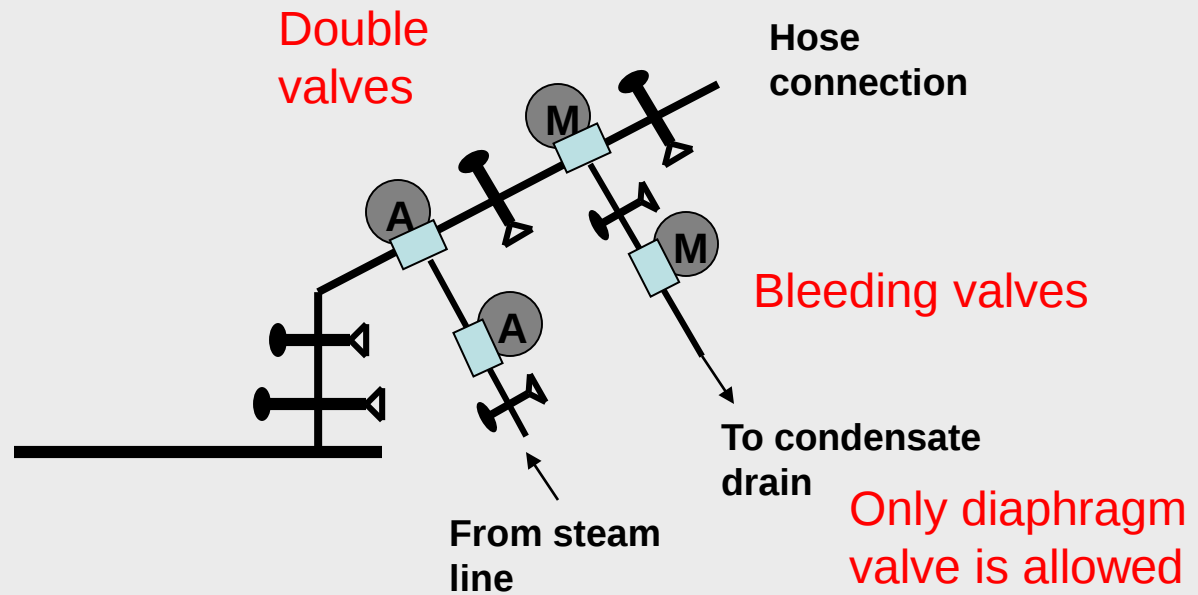
Head-plate details, top view



Entry ports

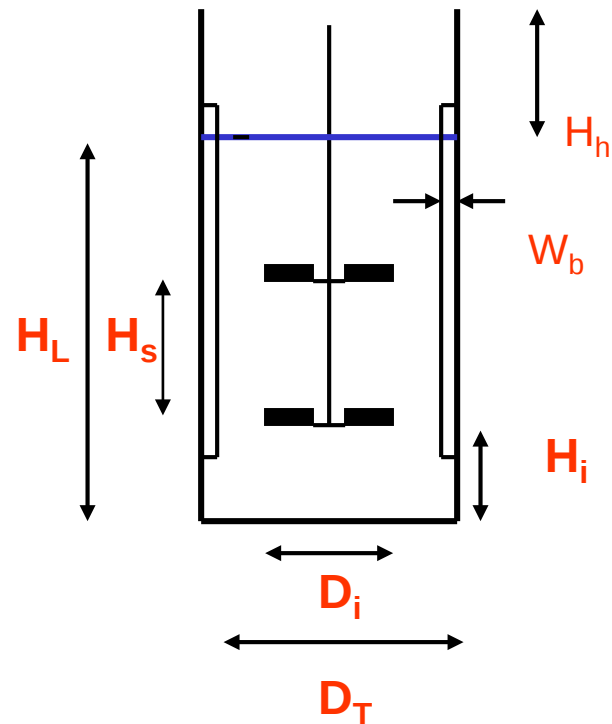
- 1 – pressure gage
- 2 – pressure transducer
- 3 – foam probe
- 4 – level probe
- 5 – viewing lamp
- 6 – addition port
- 7 – inoculation port
- 8 – blank port
- 9 – exhaust gas port

Double block and bleed valve system



Bioreactors have a standard geometry - *with some variations*

D_t = tank diameter
 D_i = impeller diameter
 H_l = liquid height
 H_i = impeller height
 H_s = impeller spacing
 H_h = head space
 W_b = baffle width



$$H_L = 2D_T = 6D_i = 6H_i = 3H_s = 5H_h = 20W_b$$



Post-session exercises

1. Describe any potential non-compliant cGMP issues with respect to the bioreactor or associated piping design and/or construction.
2. Based on your measurements of the internal components of the bioreactor, discuss any deviations from “standard dimensions”.
3. Label the components of the air supply system on your diagram in the lab manual.
4. Count and record the number of steam traps.
5. Make a diagram of the jacket temperature control loop, including valves, heat exchangers, sensors, pump and flow path.