



## Beer De-gas System

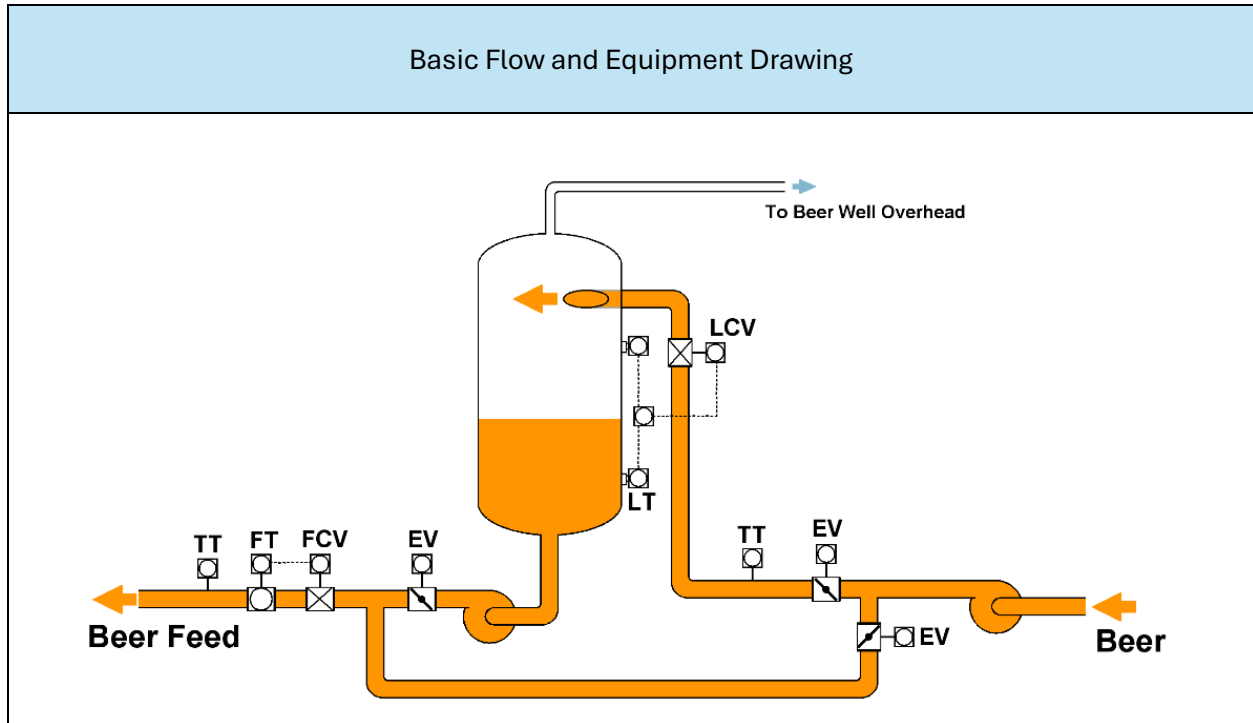
### Summary:

Most plants are built with a system in place to remove non-condensables from beer and distillation. Over time plants have proven that additional degassing systems can increase production through the removal of CO<sub>2</sub>, preventing distillation from pressuring up due to excessive non-condensable gas.

Beer De-gas systems may be added anywhere between the beer well and beer column. Locations closer to the BW, where the beer is colder, may require additional vacuum systems to encourage the off gassing of CO<sub>2</sub>. Locations closer to the Beer Column, after the beer interchangers and/or pre-heaters, make it easier to flash off CO<sub>2</sub> but also produce more condensate and VOCs.

Because every plant design is different, and many plants have some equipment available to them that others do not (de-commission flash tanks or heat exchangers), we will focus on a basic discussion of possible solutions. An engineering study could be performed for your individual situation and available equipment.

### Example ICM Beer De-gas Upgrade:



A de-gas vessel may be added after the Mash/Beer Interchange to remove CO<sub>2</sub> from the process stream prior to the Beer Column. Beer should enter the flash vessel tangentially in order to increase surface area, and off-gas CO<sub>2</sub> more effectively.

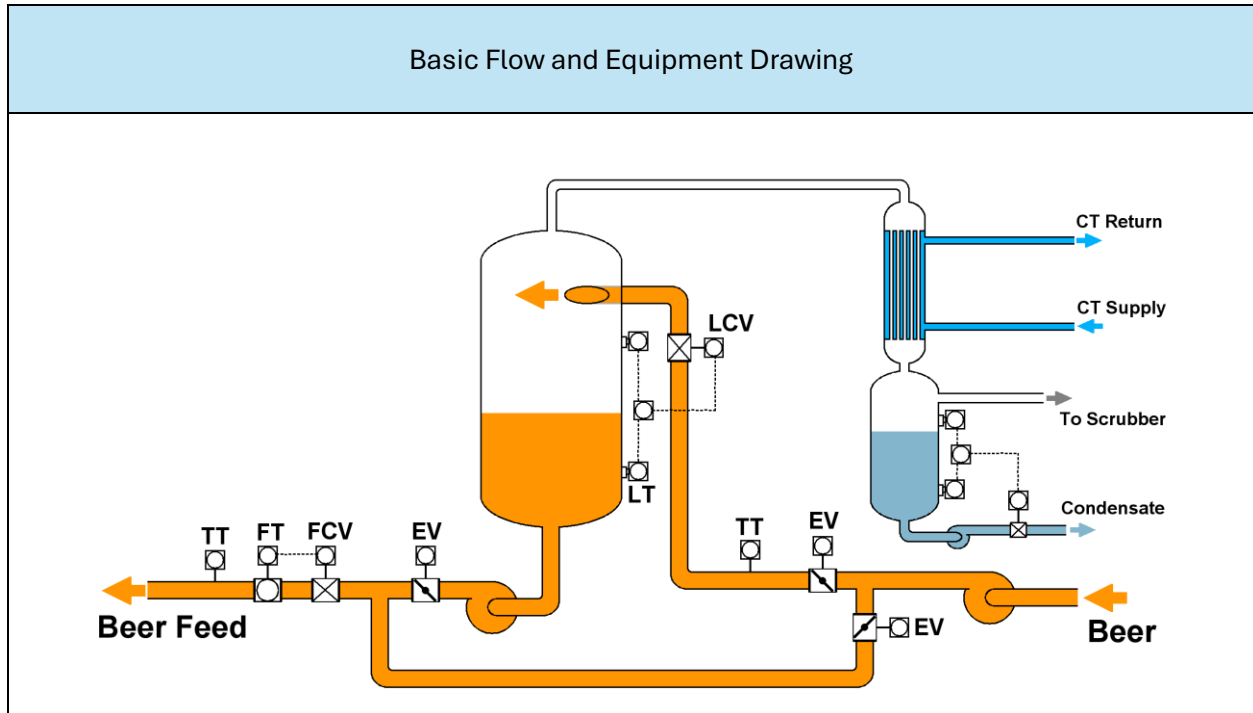
In this version, the hot beer easily flashes off CO<sub>2</sub>, which is vented back to the Beer Well headspace – where the CO<sub>2</sub> blower pulls on the system. CO<sub>2</sub>, vapor, and any VOCs (including Ethanol) are sent to the Ferm Scrubber. This will increase the load on the Ferm Scrubber and may require an updated stack test.

The pump and control valve after the flash vessel are used to control Beer Feed rate. The original Beer Feed pump and an added Level Control Valve are used to keep level within the flash vessel at about 50%. Interlocks can be added to divert the Beer Feed around the flash vessel if level goes too low or too high.

If this system is added prior to the Mash/Beer interchanger, an additional blower may be required to pull a deeper vacuum on the flash vessel, encouraging the off-gas CO<sub>2</sub>. In this ‘cold’ version, the CO<sub>2</sub> will not be removed as effectively – but will also result in lower additional vapor and VOC loading to the scrubber system.

Similar Beer De-gas systems have been shown to reduce non-condensable loads in Distillation, allowing for an increased beer feed rate of about 15%.

### Example Pressurized Distillation Beer De-Gas Upgrade:



A de-gas vessel may be added after the Mash/Beer Interchange to remove CO<sub>2</sub> from the process stream prior to the Beer Column. Beer should enter the flash vessel tangentially in order to increase surface area, and off-gas CO<sub>2</sub> more effectively.

Because the pressurized designs often have smaller Ferm scrubber systems, a condenser may be added to help clean the vapor stream – as shown above. This addition will send less volume to the scrubber, but also generate more condensate (with ethanol) – so this condensate is added back into the Beer Well. This will still increase the load on the Ferm Scrubber and may require an updated stack test.

The pump and control valve after the flash vessel are used to control Beer Feed rate. The original Beer Feed pump and an added Level Control Valve are used to keep level within the flash vessel at about 50%. Interlocks can be added to divert the Beer Feed around the flash vessel if level goes too low or too high.

### Repurposing on hand equipment:

Some plants have used their old decommissioned Cool Flash vessel for this system. There may also be heat exchangers or tanks on hand that could lower the capital expense of this project.