Checklist – Future Design Tips

Designing energy efficiency into the original design will allow for lower operating costs in the future. All members of the design team, operators, engineers, equipment suppliers and installers should be involved in the process. Life cycle cost evaluations can be performed to determine if additional capital is justified when considering energy efficiency upgrades.

The following suggestions (by no means a complete list) can be considered when building or expanding a brewery. The suggestions may not be applicable to all brewers, but may stimulate further discussion with the design team.

Services Utilities

- ✓ Determine utility requirements and any limitations associated with servicing the expected brewery capacity requirements
- ✓ Consult with the local electric, water, gas and wastewater suppliers to determine if they can supply long term capacity needs and what the future infrastructure impacts/cost will be to provide these services
- ✓ Perform calculations to determine if utility services should be installed for the planned capacity increase or if provisions can be made for upsizing the services for the future. The upsizing decision will be based on financial conditions, as well as brewery growth rate projections.

Refrigeration

- ✓ Where possible, a centralized refrigeration system should be considered
- ✓ The highest, economically feasible, Coefficient of Performance units should be included in the design
- ✓ Variable speed drives for chillers, compressors, fans, and pumps should be incorporated where possible
- ✓ Automatic control systems should be included for refrigeration unit operation
- ✓ Review refrigeration equipment to ensure it is not oversized

Compressed Air

- ✓ Design system for lowest possible header pressure set point

- ✓ Work with vendors to provide lowest possible air pressure requirements for equipment operation (Life cycle cost analysis may be needed to justify additional capital expense)
- ✓ Install variable speed drives on at least one air compressor
- ✓ Minimize or eliminate ninety degree angles in compressed air piping systems
- ✓ Design compressed air header piping in ring configuration where possible
- ✓ Exhaust hot air from air compressor room to the outside or, if located in a cool weather zone, the air may be ducted into the interior building during the cold weather season using dampers
- ✓ Bring outside cool air to the suction side of the air compressor
- ✓ Install air flow metering on major headers within the system to help determine where air leaks may exist
- ✓ Avoid using carbon steel pipe and galvanized pipe in compressed air systems. Consider aluminum and copper piping where possible
- ✓ Avoid using air knives on packaging lines. If pressure is not required, consider using low pressure motor-blowers to provide air for drying bottles or cans
- ✓ Avoid using air for cleaning; consider dry cleaning methods other than compressed air
- ✓ Avoid using air-driven motors where code classifications allow electric drives.

Steam / Hot Water Generation:

- ✓ Size boiler(s) to match load requirements. If spare boiler is required, investigate installing rapid start boiler rather than running the spare during normal operation
- ✓ When appropriate, use alternatives in place of steam boilers to produce hot water. Hot water boilers, direct fired heaters, etc. may be a better option than using steam
- ✓ In some cases, splitting the steam and hot water generation systems result in lower capital cost
- ✓ When purchasing a boiler, investigate heat recovery options such as flue gas economizers and blow down heat recovery. The most cost-efficient time to install these items would be as part of the original purchase package
- ✓ Include O2 trim control with variable speed drive combustion fan when installing new boilers
- ✓ Automate boiler control
- ✓ Maximize steam condensate return
- ✓ Insulate all steam piping and control valves located on boiler and on the steam system

- ✓ Install boiler feed water flow meters, make up water flow meters and condensate return meters.

Pumping Systems:

- ✓ Size equipment to match load. Make necessary provisions to add on equipment and, if possible, avoid installing future equipment until required
- ✓ Avoid ninety degree angles and include more offset angles. This will minimize friction losses in the piping system
- ✓ Replace control valves with variable speed drives where possible. If the load varies on a regular basis, a variable speed drive (VSD) is a viable option. Motors controlled by variable speed drives should be rated for invertor duty
- ✓ Install high efficiency pumps and premium efficiency motors to power the pumps.

Heat recovery:

- ✓ Assess all waste heat sources to determine if heat exchangers can be installed to capture waste heat and be used for preheating water somewhere else in the process
- ✓ Review mash cookers, brew kettles, wort coolers, boiler flue stacks, etc. to determine if waste heat can be reused in other applications
- ✓ If possible, install waste heater suppliers and heat users in close proximity to avoid long piping runs

Lighting:

- ✓ Consider installing high efficiency lighting such as Fluorescent T5 or T8 lighting with electronic ballast in lieu of T12 or HID lighting
- ✓ Include motion / occupancy sensors where possible, as well as photo sensors on outdoor lighting
- ✓ If possible, install sky lights to avoid lighting during daylight hours
- ✓ Install a building management system to control lighting and HVAC during times when the operation is shut down
- ✓ Avoid over lighting; only install the amount of foot candles necessary for the application. For example, a warehouse may only require 20 foot candles whereas a production line may require 60 or more foot candles.

General Considerations:

- ✓ Work with vendors to ensure that all energy and water efficiency options have been discussed and installed where economically viable
- ✓ Calculate the life cycle cost adding capital to equipment and installation materials to determine if these items are cost justified. When calculating the return on investment, include only the premium capital cost in the cost justification
- ✓ Match all equipment and piping systems to the load. Make provisions for future expansion rather than installing equipment and piping systems to meet future needs at the time of initial installation
- ✓ Insulate all hot water piping, valves and flanges above 120 F. Blankets can be used on valves and flanges to allow for future maintenance
- ✓ Automate the process as much as possible
- ✓ Include energy and water metering into the original design. Electronic metering will allow for continuous energy management, which will result in lower operating costs
- ✓ Utilize exhaust heat from the process, warmers, compressors, etc. to lower building temperature and use less energy for HVAC, exhaust fans and air movers.