Appendix 5. Beer and beverage

Sector Specific Annex to Audit Guideline under the EE Incentive Scheme for energy intensive industries in Vietnam

1 Introduction

The purpose of this annex is to secure that the most important opportunities for energy efficiency improvements in the beer and beverage sector are investigated.

The annex is prepared to provide more sector-specific guidance than what is presented in the general energy audit guideline prepared under the Danish/Vietnamese cooperation.

As such, the guideline describes the most important focus areas within the key technologies of:

- **Mashing and wort boiling** is the process of heating water, malt, and additives to release sugars for fermentation from the malt. Subsequently, the beer is cooled to avoid contamination.
- **Pasteurization** is the process in which the finished product is gradually heated and subsequently gradually cooled to ensure a longer shelf life of the product.
- **Bottle- and keg-washing** is the process where used bottles are returned to the company and are cleaned and washed before re-filled with products.
- **Refrigeration:** Cooling is typically produced centrally at breweries and distributed to cooling consumers throughout the plant. Cooling is typically produced using ammonia chillers and distributed through either a glycol media or as ice water.
- **Clean-in-place (CIP) systems** require significant amounts of energy to heat water, as the chemicals used for cleaning are most effective at a certain temperature (between 60 – 80˚C)
- **Steam boilers and distribution** are used to deliver heat for heat requiring processes across the facilities.

- **Compressed air** is used to power the machinery of the facilities and is therefore applicable to all processes powered by heavy machinery.
- **Heat recovery systems** are applied to recover heat either at individual processes or to supply waste heat across several heat users.

Heat recovery is applicable to most of the key technologies individually, while overall systemic mapping of heat recovery is also important, as energy recovered from one technological process may be used in another.

2 Technology review compared with Best Current Practice

In the table below, best practice energy efficiency projects are listed for each of the technologies above. The energy audit should consider the possible viability of each of the measures in the specific context.

The energy audit report should document how these potential measures have been considered. For each measure it should be stated whether it is practically relevant for the specific enterprise. If it could be relevant, the report must make a pre-assessment of the technical and financial viability.

No.	Technology	Energy efficiency measures
1	Mashing and wort boiling	• Hot water for the mashing processes is to be heated using heat from waste heat recovery systems. • Preheating of wort to the cooking process can partly be covered via waste heat. • Heat in vapour from the wort boiling can be recovered (solution is named a Phaduco-system). • Mechanical Vapor Recompression (MVR) can be applied for the wort boiling process. • Cooling of wort after the boiling process shall not be done via cooling from compressor systems but via cold water, where heat is recovered when producing hot water for the mashing process etc.

No.	Technology	Energy efficiency measures
		• All steam piping, valves and tanks are to be insulated. • Investigate and optimize delta-T in all plate heat exchangers.
2	Pasteurization	• Regenerative heating and cooling are to be applied. • Investigate and optimize delta-T in all plate heat exchangers. • Optimal heat source is to be selected – preferably hot water partly heated via waste heat recovery systems. • Optimal cooling source is to be selected – cooling brine should only be 2°C colder than the target temperature. • Piping, valves, and the pasteurizer unit itself should be insulated.
3	Bottle and keg-washing	• Heat is to be recovered and circulated across the different zones in the washing system. • Optimal heat source is to be selected – preferably hot water partly heated via waste heat recovery systems. • Optimal cooling source is to be selected – cooling brine should only be 2°C colder than the target temperature. • Investigate and optimize delta-T in all plate heat exchangers. • Piping and valves should be insulated.

No.	Technology	Energy efficiency measures
4	Refrigeration	• See Technology Catalogue for refrigeration systems.
5	CIP-Systems	• Water reused from last rinse to first flush etc. • No “once-through” cleaning to be applied, i.e., cleaning water can be used more than once until too polluted. • Measurement of quality of cleaning water (conductivity). • Heat recovery from wastewater to fresh water. • Optimal heat source is to be selected – preferably hot water partly heated via waste heat recovery systems. • Minimization of cleaning periods.
6	Steam boilers and distribution	• See Technology Catalogue for boiler and heating systems.
7	Heat recovery	• Heat can be recovered from other areas than the beer processing equipment above, by example: - From refrigeration plants o De-superheating. o Oil cooling. - Heat from compressed air. - Heat from flue gas (boilers). - CO_2-regeneration plant. - Additional process heat sources.