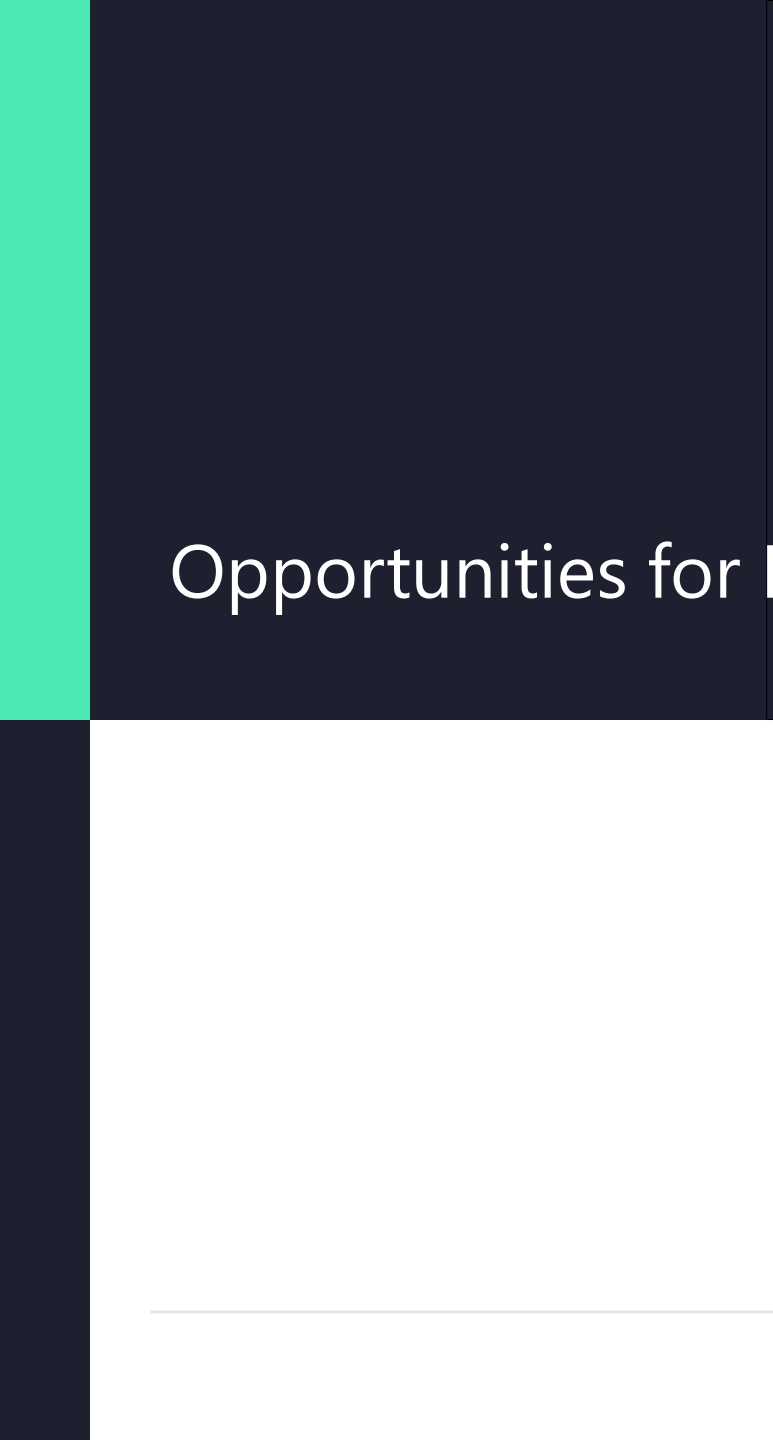
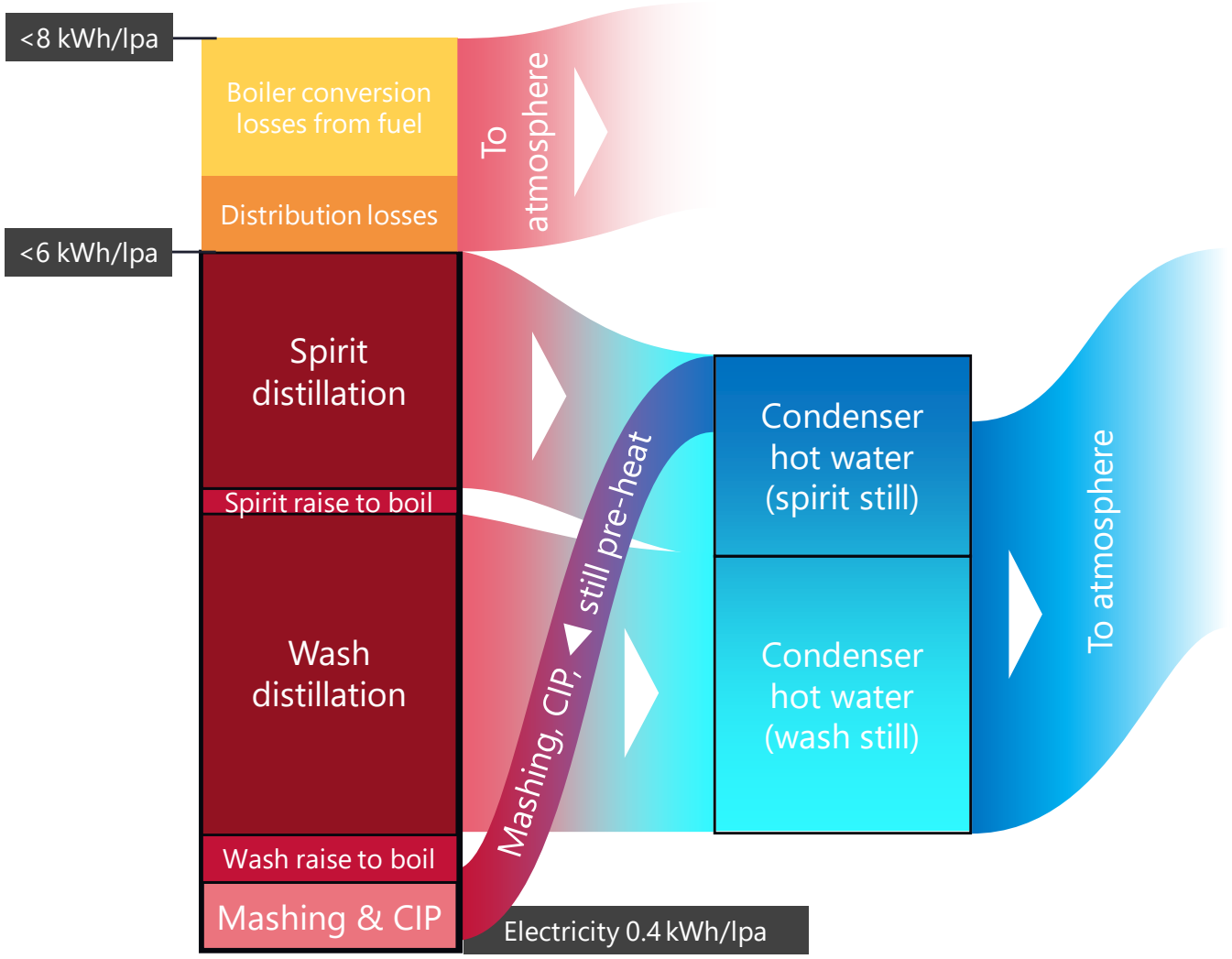
Opportunities for Heat Recovery





Where does the thermal energy go?



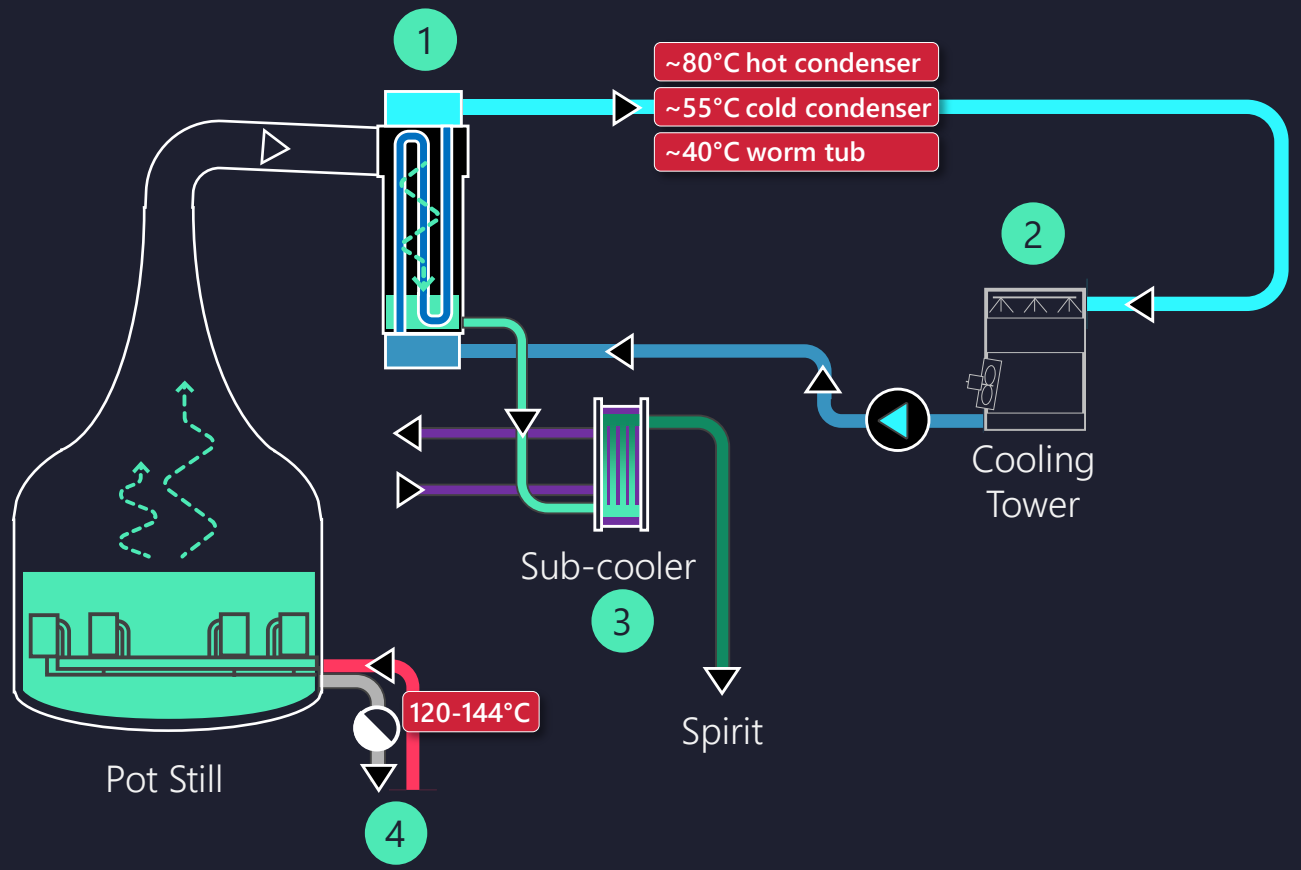
Whisky distillery

- Fossil fuel boiler
- Specific energy use of typically <8 kWh/lpa for an 8.5% ABV wash
- Distillation accounts for 80% of thermal energy usage
- ~80% of energy including boiler and distribution losses
- Clear focus for energy efficiency/energy reuse.

© Briggs of Burton – Private and Confidential

The picture can't be displayed.

Conventional still heating



1 Flooded tube condenser

- Typically, a flooded tube condenser is used – these are defined by the outlet temperature as 'hot' or 'cold'.
- A different type of condenser called a worm tub is occasionally used – produce only warm outlet water.
- Hot condensers have increased copper/spirit interaction – they produce lighter spirit and wear faster

2 Cooling water

- Cooling water is typically closed-loop (recycled) but single pass cooling water from local water course can be used.
- Closed loop cooling water is typically cooled in a cooling tower – these can be wet (evaporative) or dry (fin-fan)

3 Sub-coolers

The spirit needs to be cooled from its condensation temperature to below its flash point for safe/low-loss storage. Cold condensers typically include sub-cooling within their design, but hot condensers require external sub cooling (via shell-tube or plate heat-exchanger)

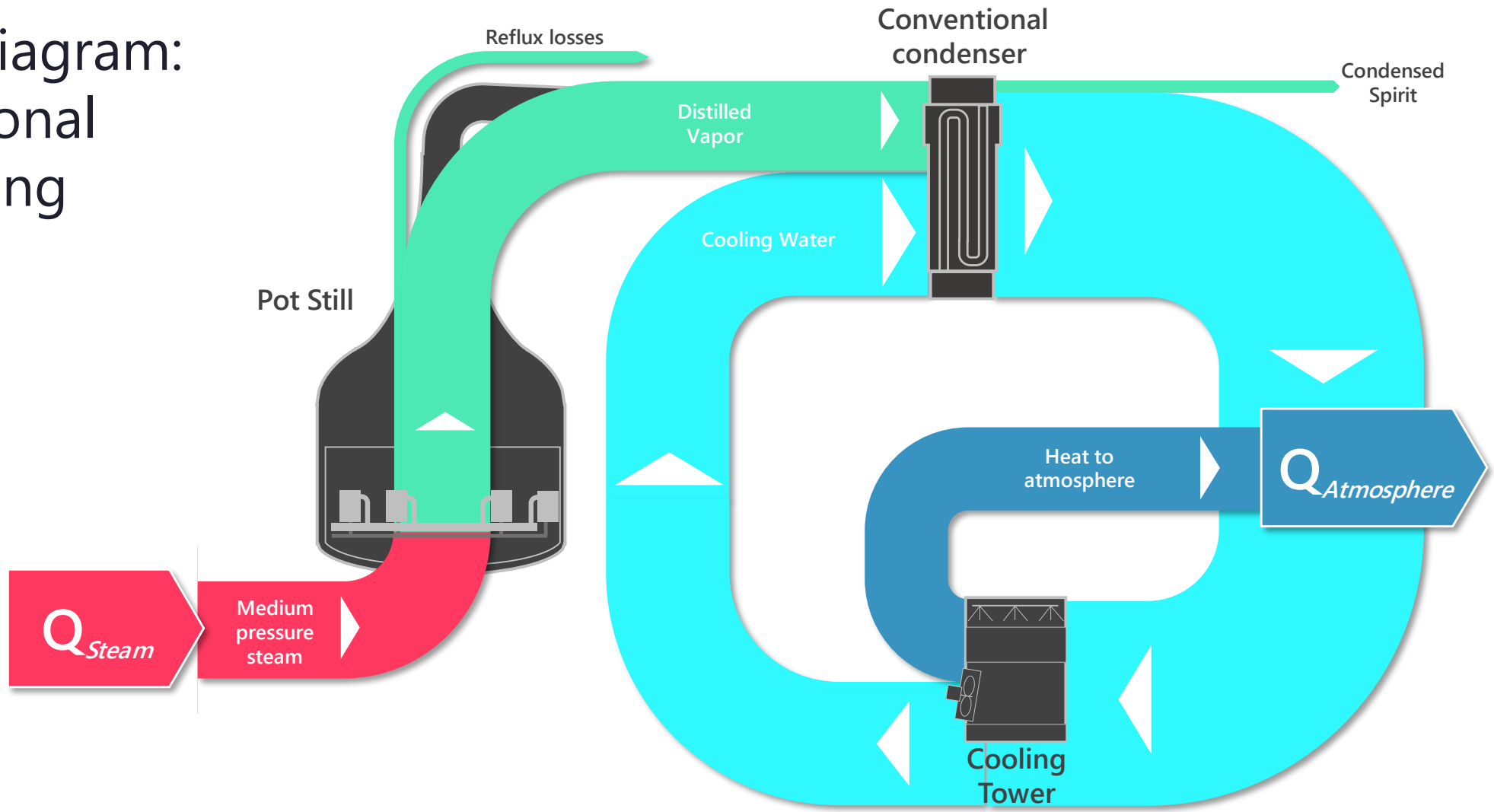
4 Still heating

Internal still heating (e.g. pans/coils) is typically used. Steam is used at 1-3 Barg

© Briggs of Burton – Private and Confidential

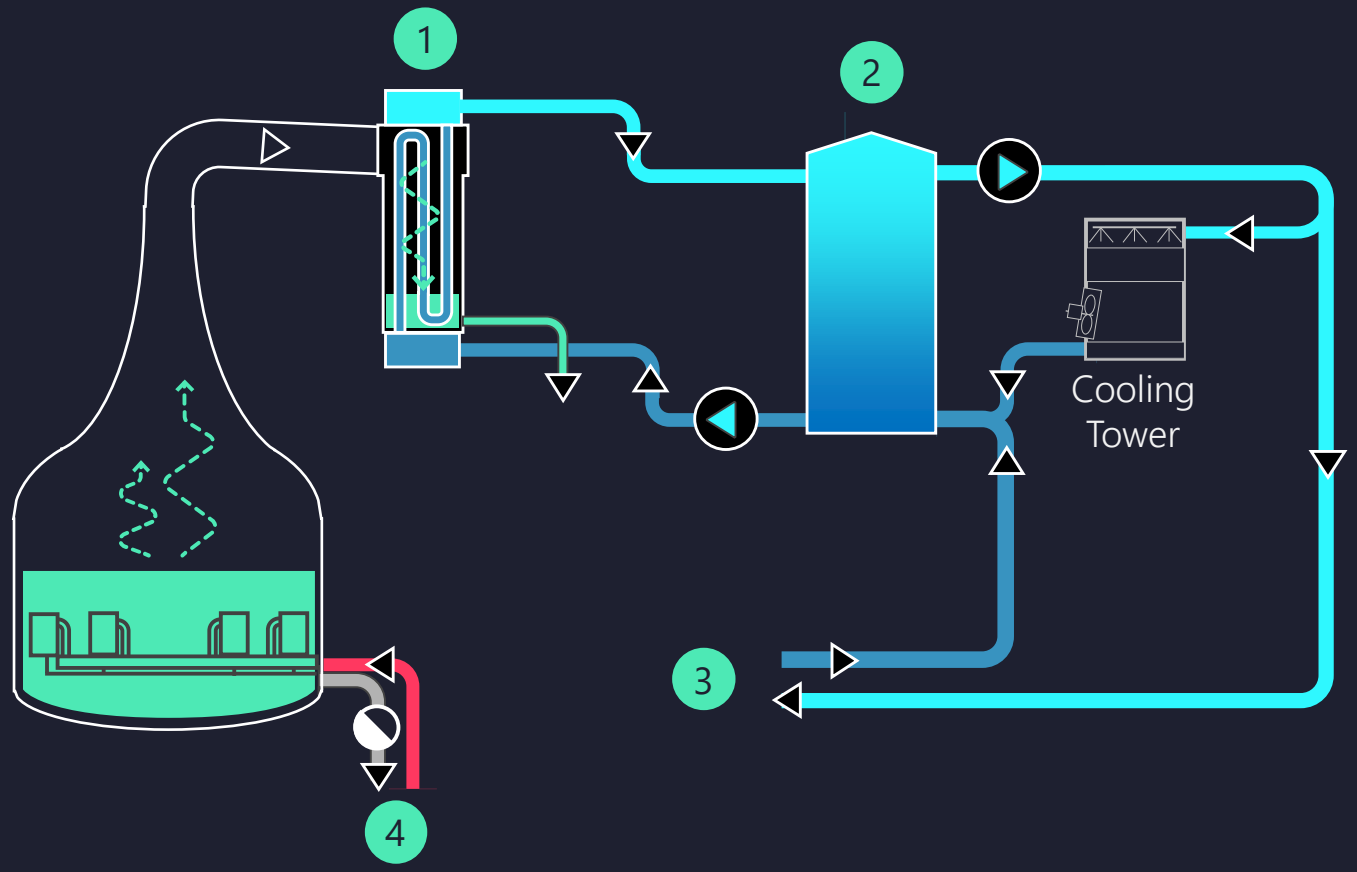
The picture can't be displayed.

Sankey Diagram: Conventional Still Heating



© Briggs of Burton – Private and Confidential

ThermoStore – recovering condenser heat for use elsewhere in the distillery



1 Flooded tube condenser

A conventional flooded tube condenser can be used but optimum performance is achieved from the hottest condenser water

2 Thermal Store

A thermal store (or hot and warm well) is required to store heat from the condenser water. Typically, the recovered heat users will not be able to absorb all the stored heat therefore a cooling tower will also be required

3 Recovered heat for process heating

The hot water from the energy store is used for a variety of process heating applications in the distillery – these can be wash/low-wines pre-heating, mash/sparge water heating, CIP makeup, and malting

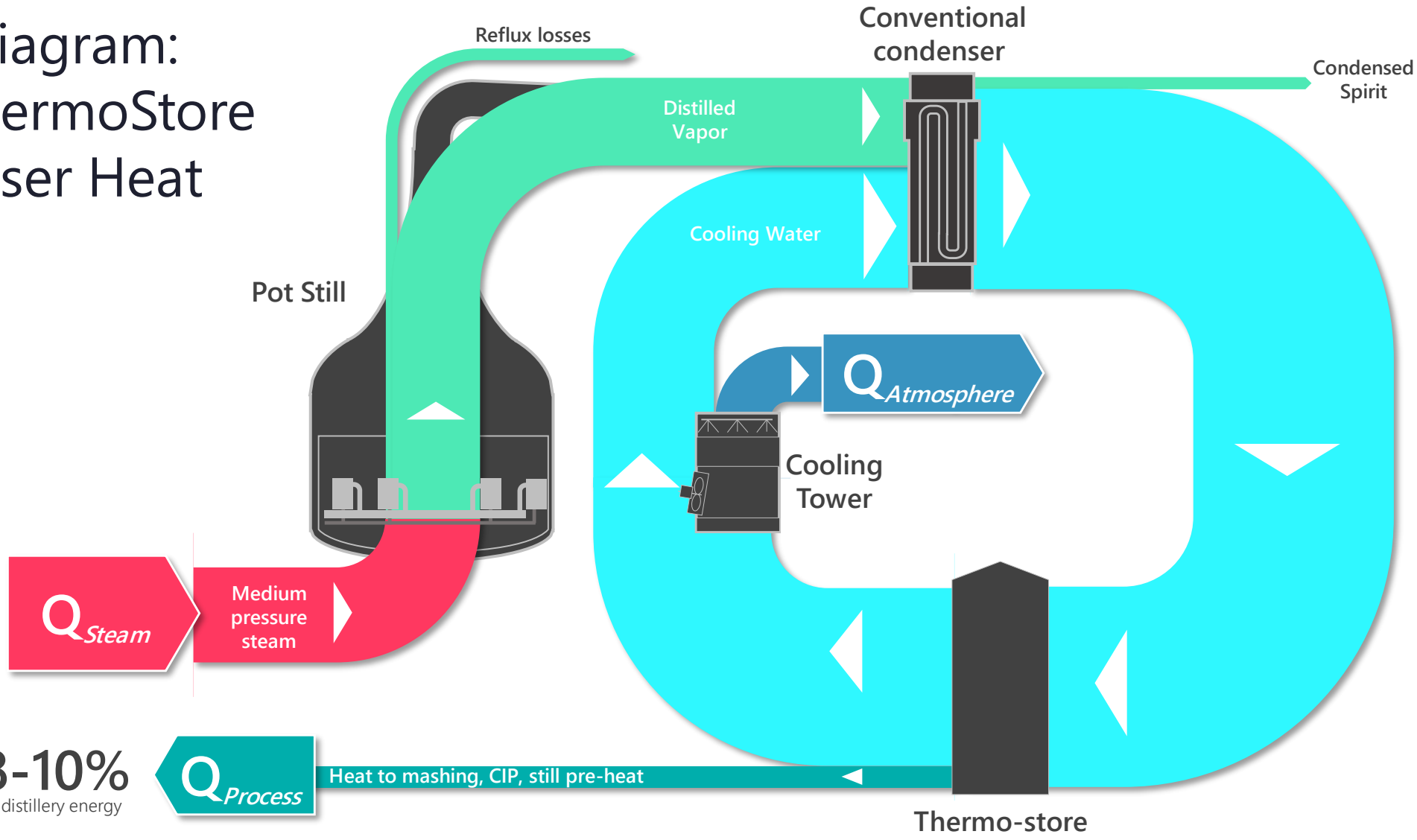
4 Still heating

Internal still heating e.g. pans/coils or external still heating can be used

© Briggs of Burton – Private and Confidential

The picture can't be displayed.

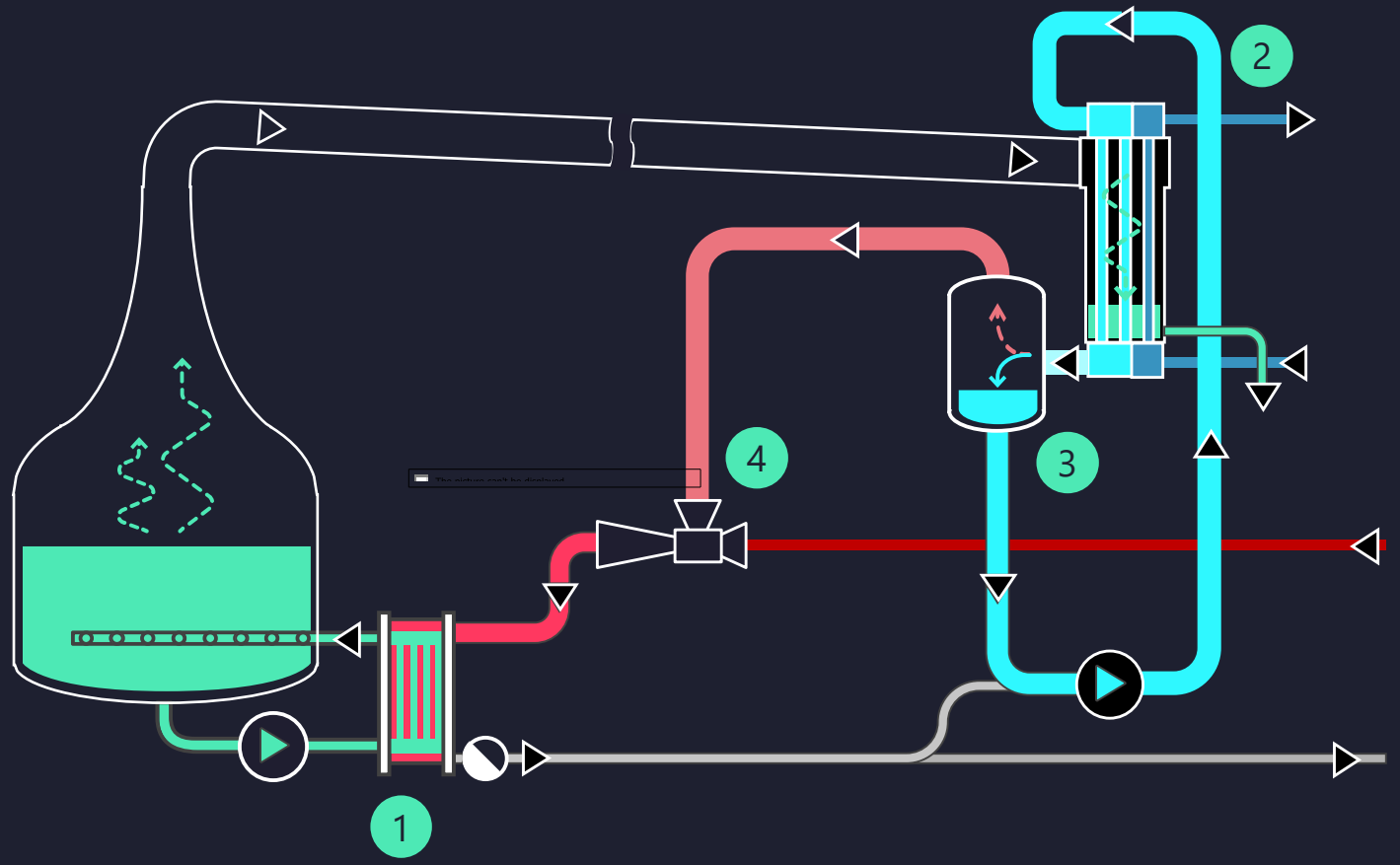
Sankey Diagram: Briggs ThermoStore - Condenser Heat Recovery



Energy saving ≈ 8-10% of distillery energy

© Briggs of Burton – Private and Confidential

TVR - An established technology to support sustainable process heating



1. Still heating

Required heating performance is achieved with external still heating

2. Falling film & flooded tube condenser

Condenses spirit vapour in a similar way to standard condensers but the cooling water in the falling film part leaves the condenser partially vapourised

3. Separator vessel

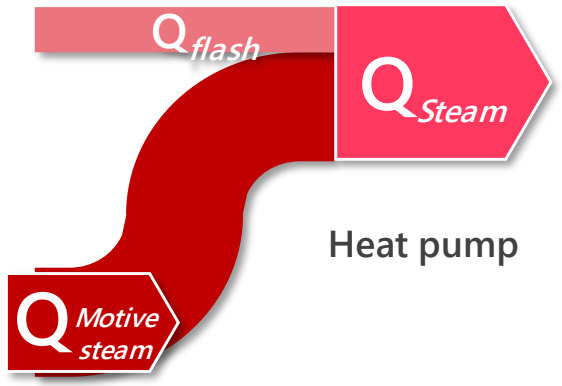
Separates vapour fraction from cooling water, which will be compressed to heat the still

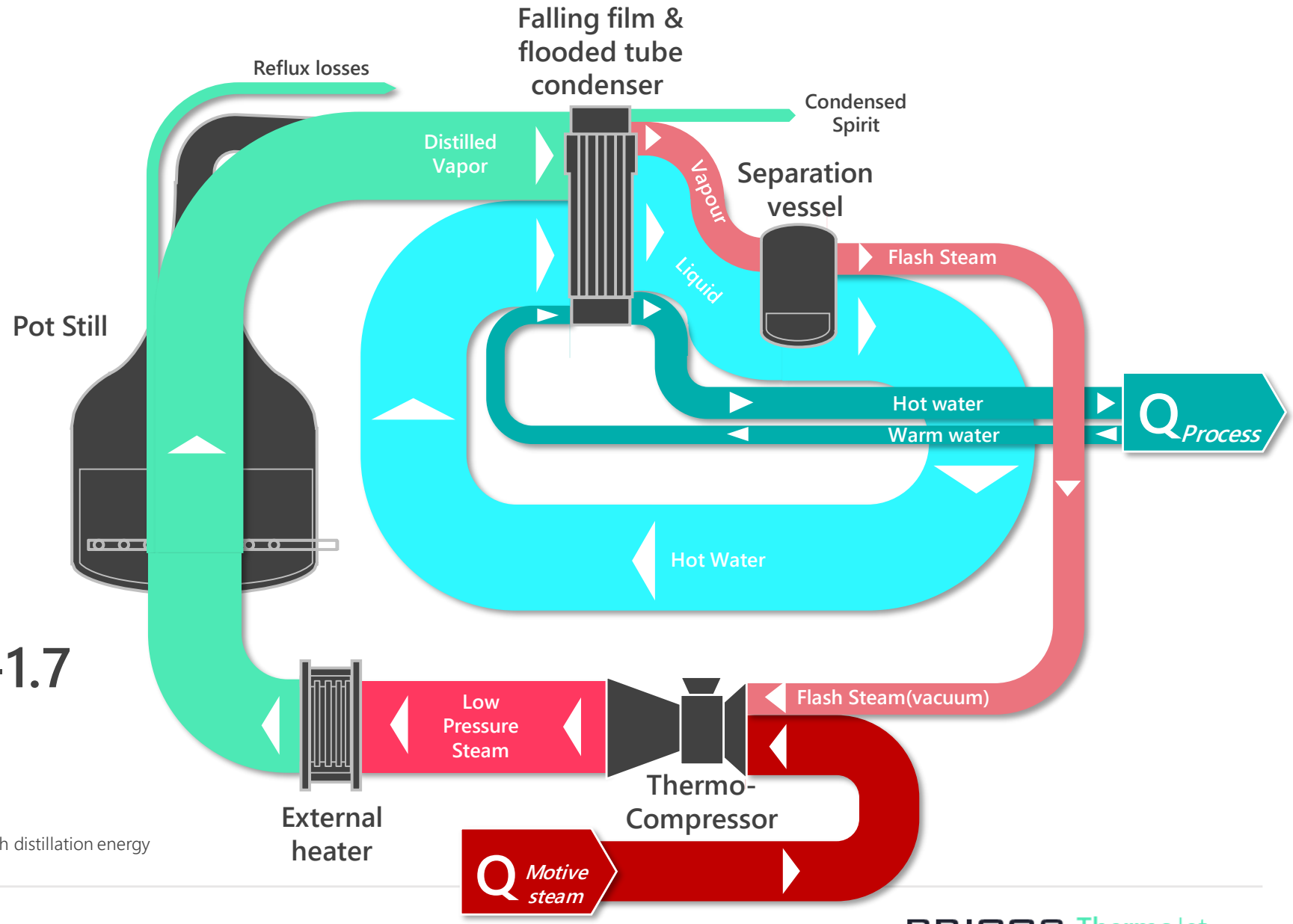
4. Steam Thermo-compressor

Uses high-pressure motive steam to compress flash vapour into steam to heat the still

© Briggs of Burton – Private and Confidential

Sankey Diagram: TVR system



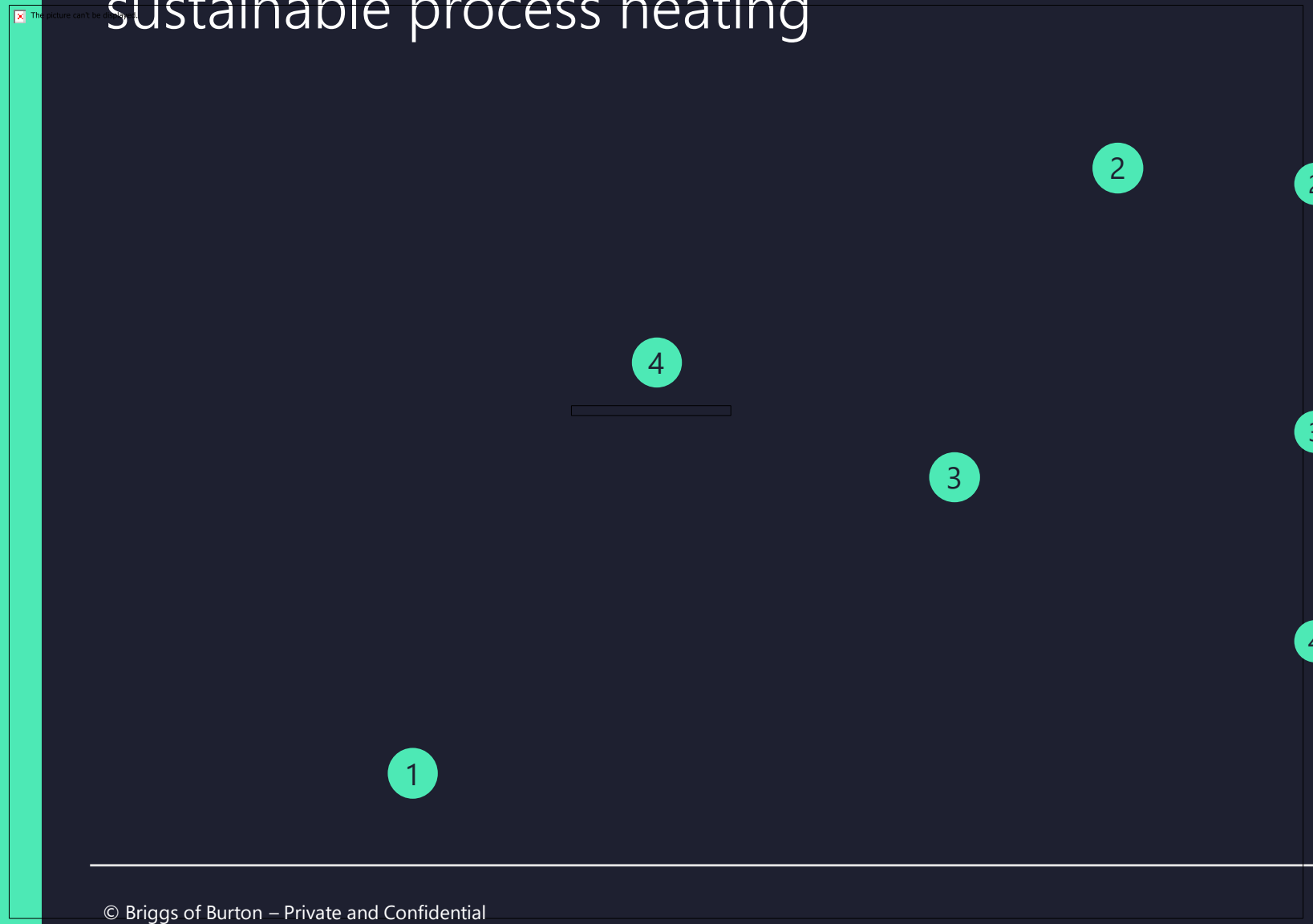


$$COP = \frac{Q_{steam}}{Q_{motive}} \sim 1.4\text{-}1.7$$

Energy saving ≈ 35-40% of wash distillation energy

© Briggs of Burton – Private and Confidential

MVR - The key technology to enable sustainable process heating



1 Still heating

Optimum performance is achieved with external still heating. Internal still heating e.g. coils is possible but has a performance impact

2 Falling film condenser

Condenses spirit vapour in a similar way to standard condensers but the cooling water leaves the condenser partially vapourised

3 Separator vessel

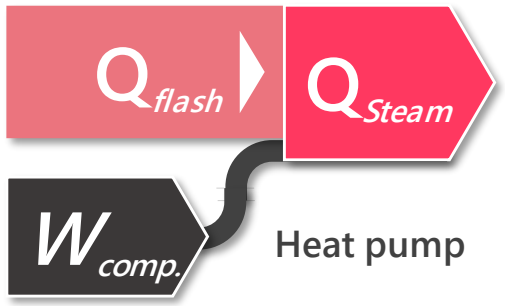
Separates vapour fraction from cooling water, which will be compressed to heat the still

4 Steam compressor

Uses electricity to compress vapour into steam to heat the still

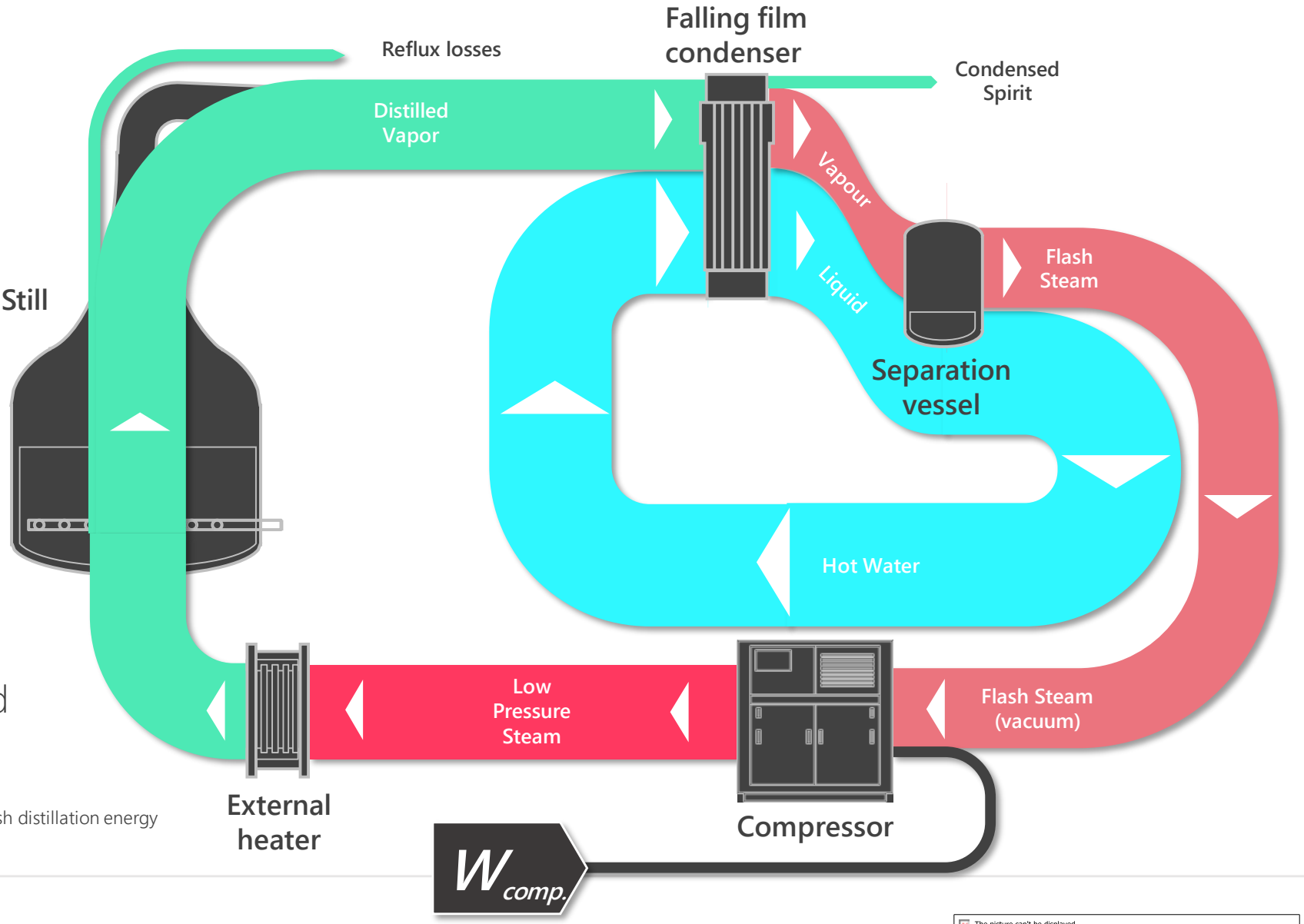
© Briggs of Burton – Private and Confidential

Sankey Diagram: MVR system



$$COP = \frac{Q_{steam}}{W_{comp.}} \approx 5_{start} - 20_{end}$$

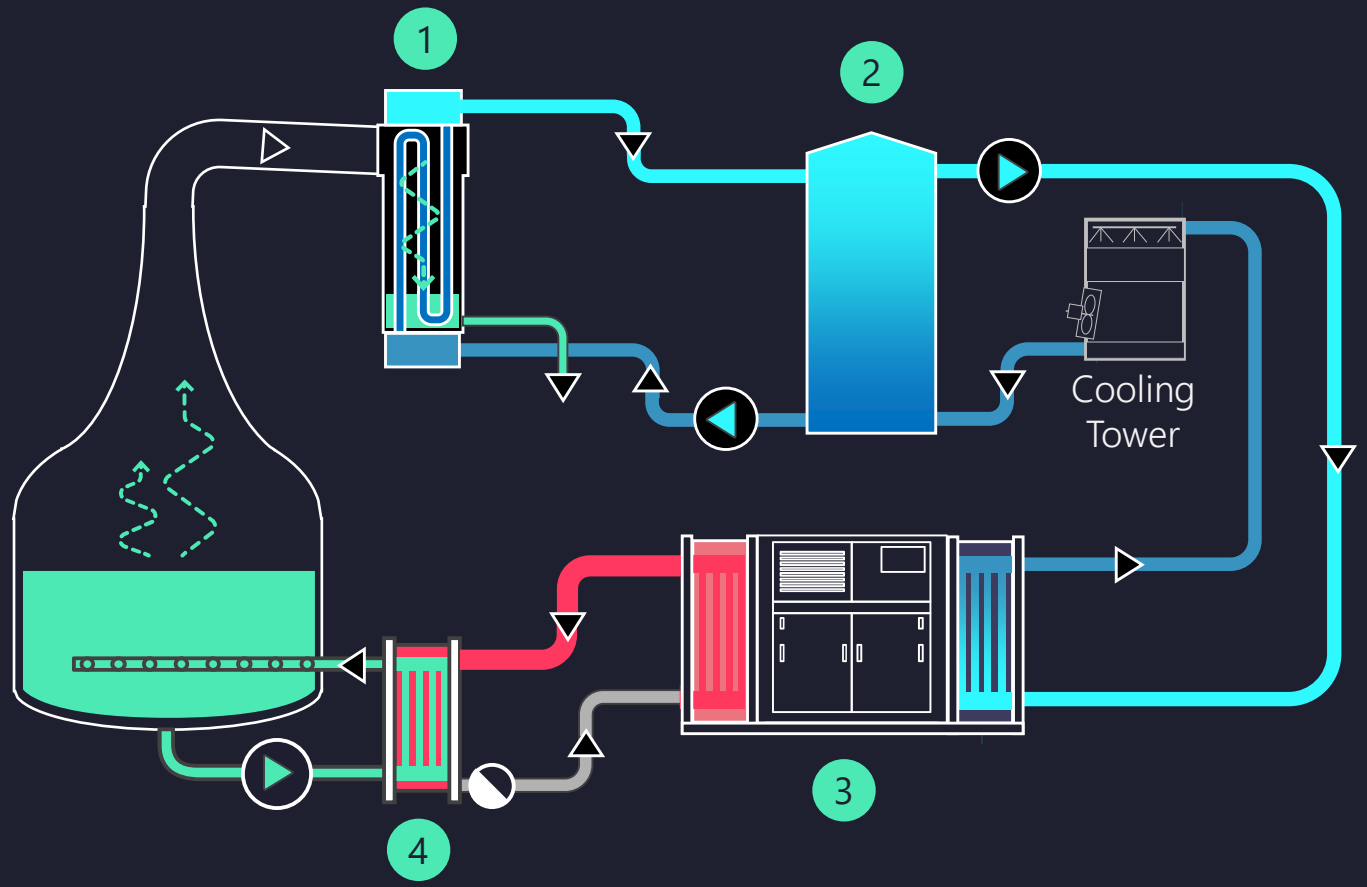
Energy saving ≈ 85-95% of wash distillation energy



© Briggs of Burton – Private and Confidential

The picture can't be displayed.

HTHP - Technology to unlock sustainable still heating



1 Flooded tube condenser

A conventional flooded tube condenser can be used but optimum performance is achieved from the hottest condenser water

2 Thermal Store

A thermal store (or hot and warm well) is required to store heat from the condenser water. Typically, the HTHP will not be able to absorb all the stored heat therefore a cooling tower will also be required

3 High Temperature Heat Pump (HTHP)

The HTHP removes heat from the condenser water on the cold side and generates steam on the hot side

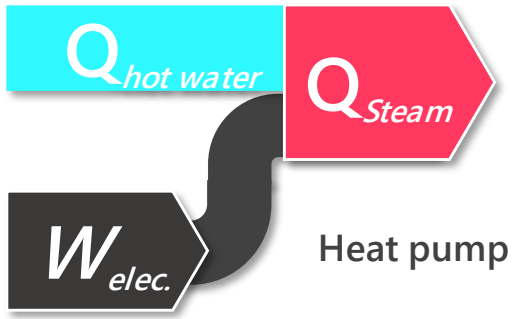
4 Still heating

Optimum performance is achieved with external still heating. Internal still heating e.g. pans/coils is possible but has a performance impact

© Briggs of Burton – Private and Confidential

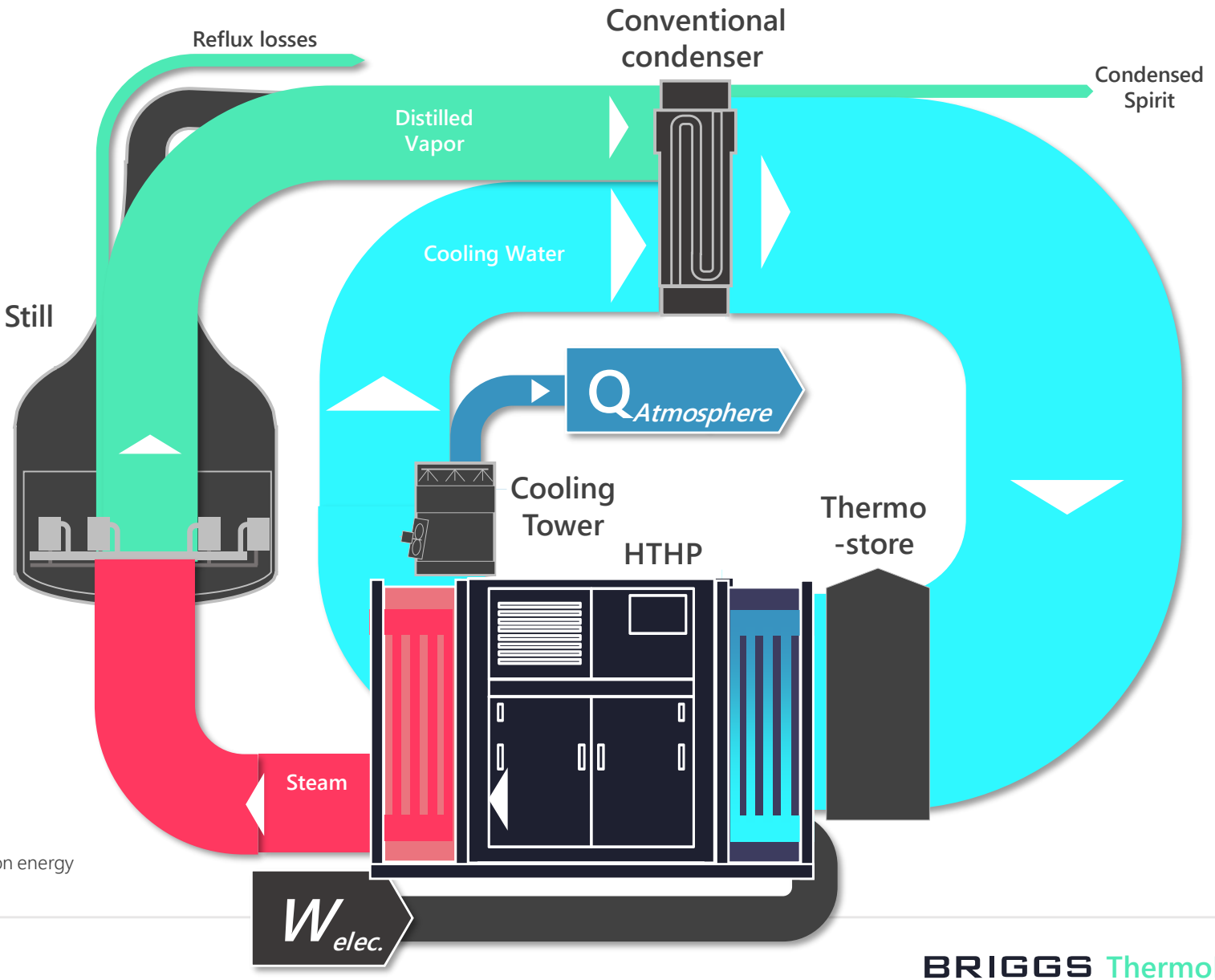
The picture can't be displayed.

Sankey Diagram: HTHP



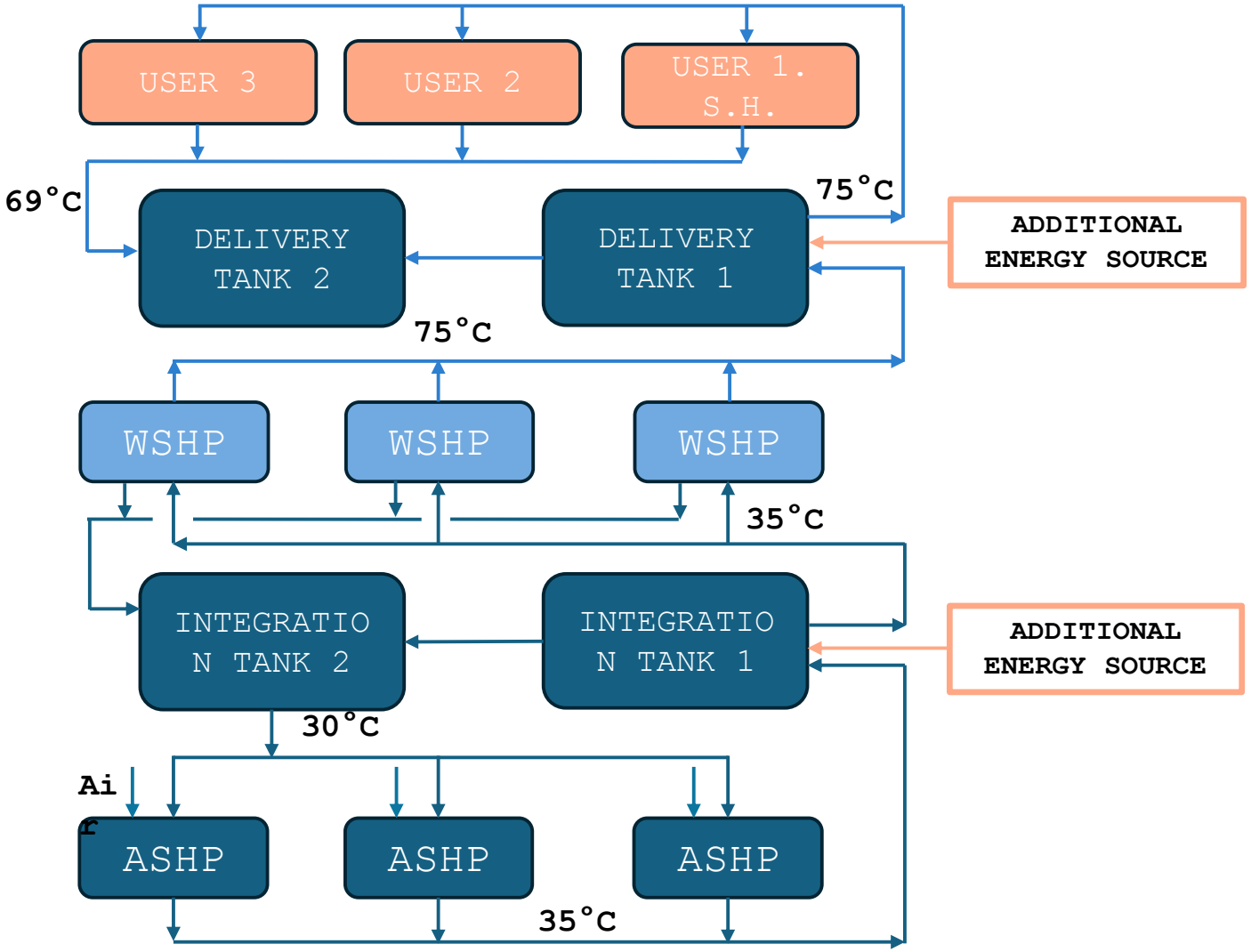
$$COP = \frac{Q_{steam}}{W_{elec.}} \quad \sim 2\text{-}3$$

Energy saving ≈ **50-65%** of wash distillation energy

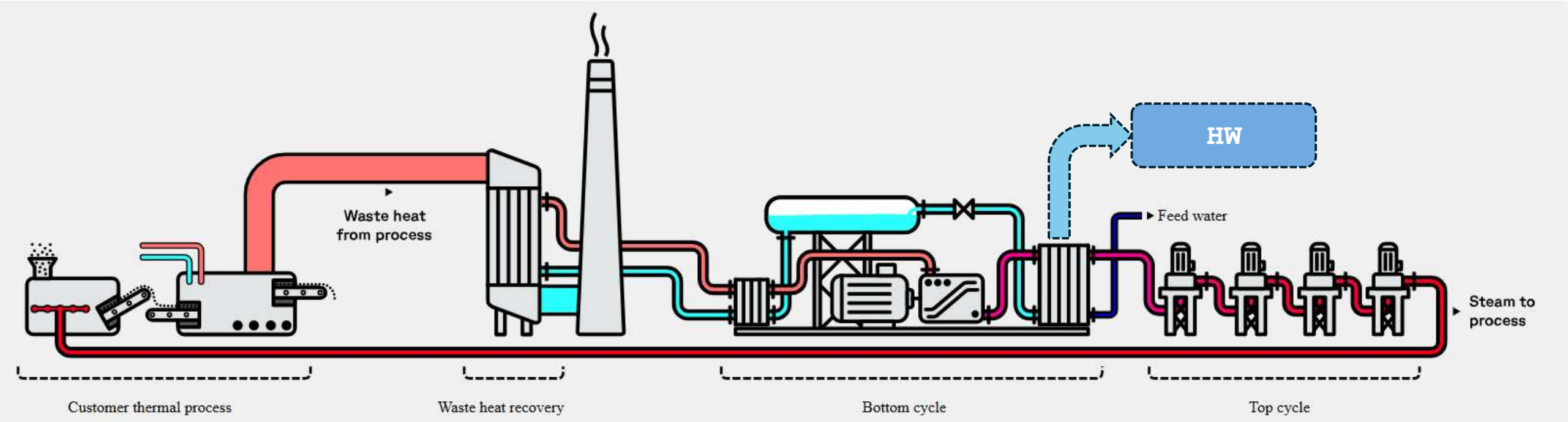


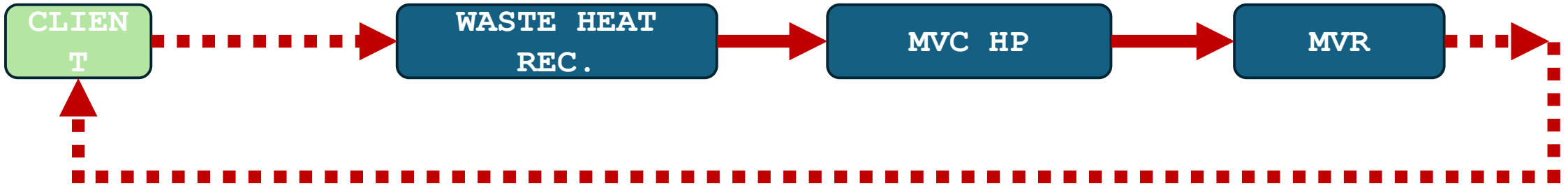
© Briggs of Burton – Private and Confidential

MVC HP. SPACE HEATING CASCADE SYSTEM FOR S.H



DRYER HEAT RECOVERY USING HYBRID. MVC + MVR





Source: www.aneoindustry.com/en/solutions

A BALANCING ACT. FINDING THE RIGHT SOLUTION

