

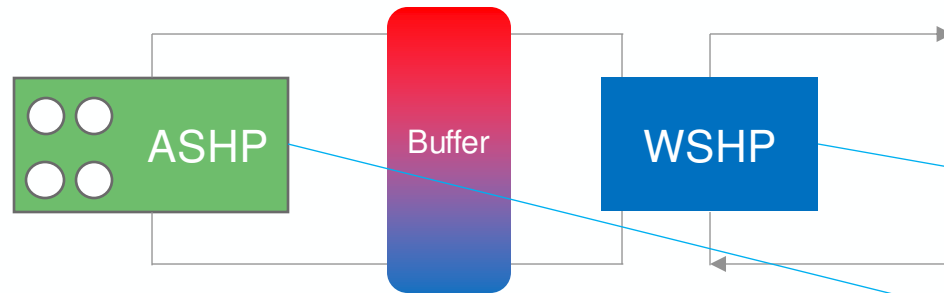


CLADE LARCH CASCADE RANGE //

For some installations a straight boiler replacement is required at normal boiler temperatures of around 80/70C flow and return.

Heat pumps are amazing and can achieve this but require two stages to do so. Clade use two hydrocarbon refrigerants, r290 and r600a in an ASHP and WSHP respectively.

These are in fact versions of our Aspen and Willow heat pumps with buffer tanks between to make operation as efficient as it can be.



The low temperature air source heat pump generates 45C water with a small delta T

The high temperature water source heat pump generates 80C and can accept 70C in the return

Intermediate thermal stores act to smooth operation of each HP by stopping feedback loops, these can also be used to time generation for efficiency





LARCH CASE STUDY //

This is an example installation to demonstrate the characteristics of a cascade heat pump system. In this instance the system is designed to deliver the full duty of 560KW at 80/70°C. In other systems the cascade may only supply part of the duty.

The advantage of this arrangement is the direct replacement of boiler technology without affecting the wider heating system.

The disadvantage is the increased electrical load (two sets of compressors) which will require a larger supply and the space taken. The complexity of the system can also increase the operational and maintenance costs.

The system consists of two ASHP and two WSHPs sized to match each other. Intermediate buffers smooth the operation by disconnecting the two heat pumps.

- 2 x 280kw r600a high temperature WSHP with a COP of 3.89
- 2 x 160kw r290 low temperature ASHP with COP of 2.81

System **COP of 2.1** (=280/(72+57))

