

TASK 3 & TASK 4
VAPOUR COMPRESSION HEAT PUMPS
& 4S-DHW

iStute 27th April 2017

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Ulster progress

Previously Reported

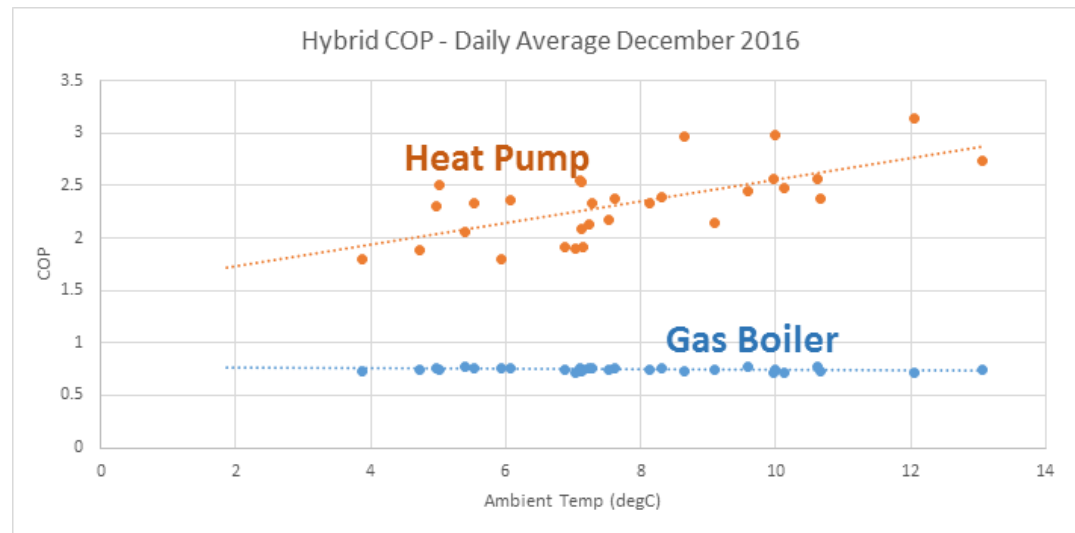
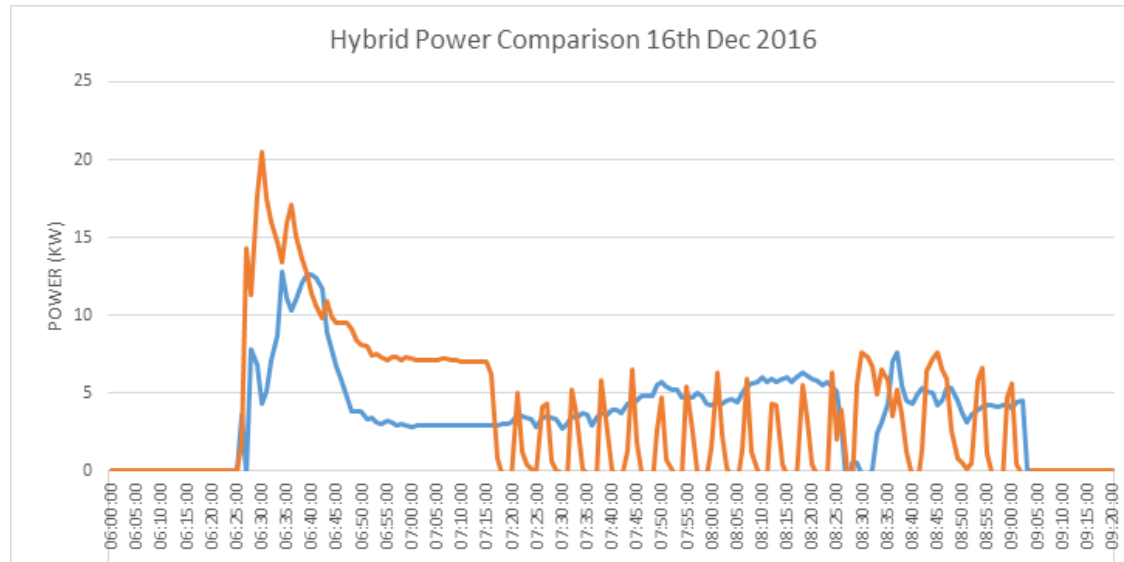
- **Aim**
- High performance heat pumps for domestic and industrial applications
- **Domestic Heat Pump**
- Working with air-source heat pump and thermal storage tank (water)
- **High Temperature Heat Pump**
- R245fa providing heat in a hospital
- Operating with Seasonal Thermal Energy Storage



Date	Heating Capacity	Power IN	COP	COPh	η isen	Cr
	kW	kW	kW/kW		%	
01-Dec	40.36	7.82	5.16	6.27	75.48	3.63
09-Jan	28.33	6.12	4.63	4.45	51.64	4.13
18-Feb	38.63	6.97	5.54	6.52	70.15	3.31
19-Feb	37.84	6.76	5.59	6.22	66.67	3.34

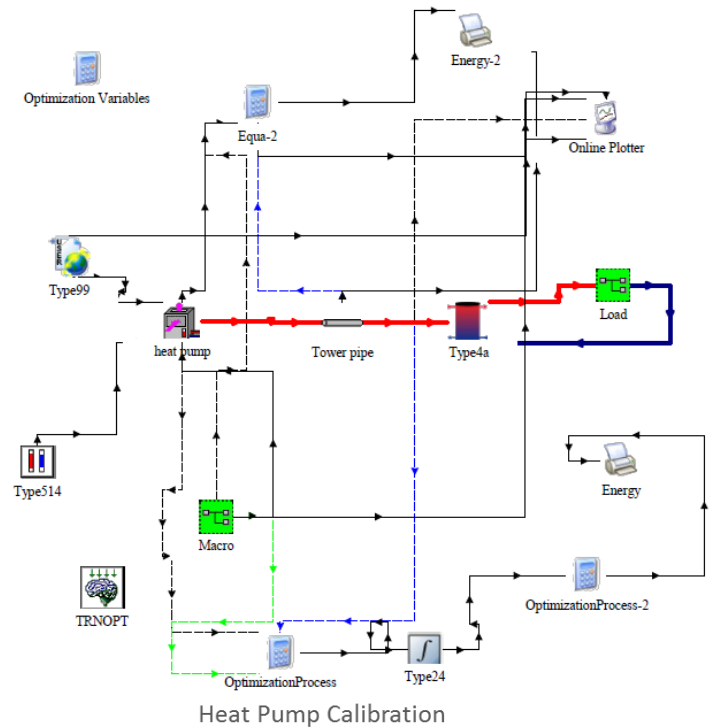
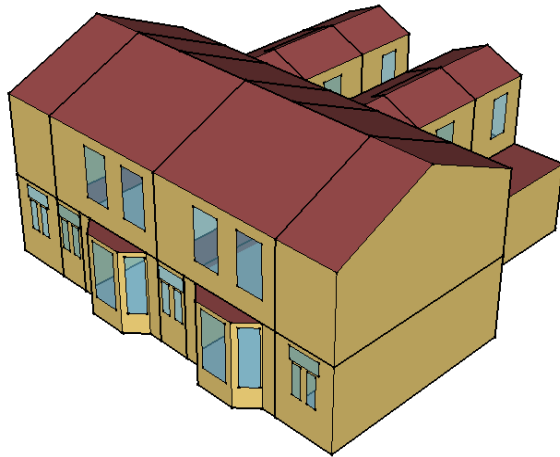
Hybrid HP month test run Dec 2016

Running HP and Gas in series

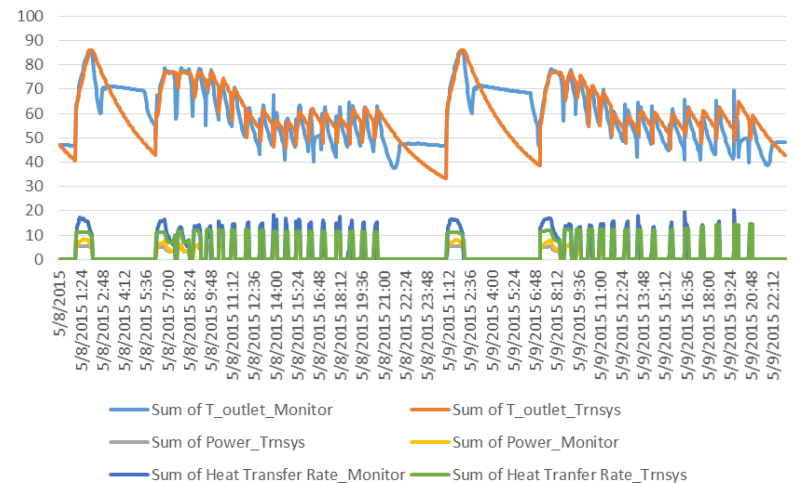


The Base Case - TRNSYS

Ulster's Terrace Street

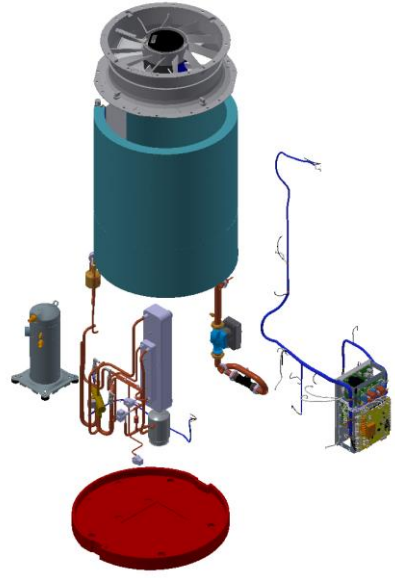
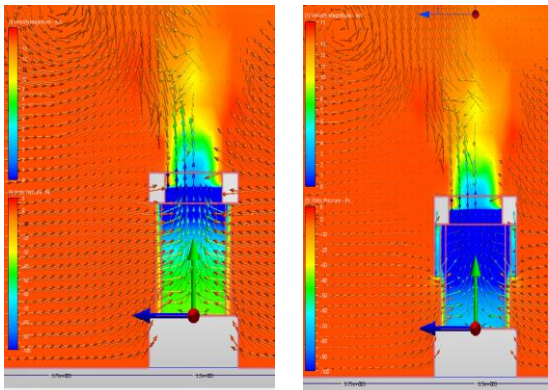
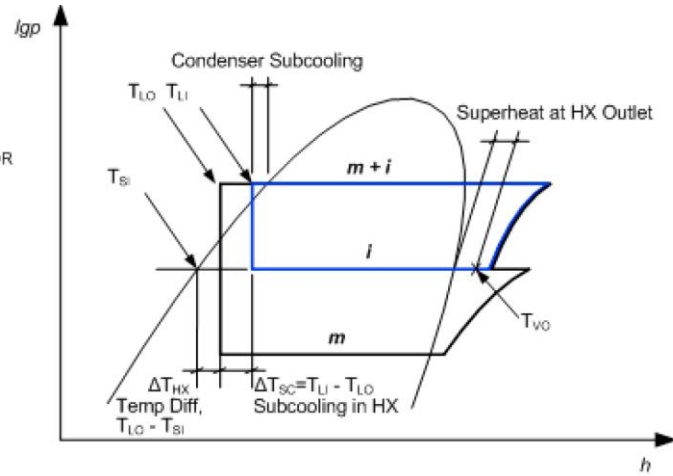
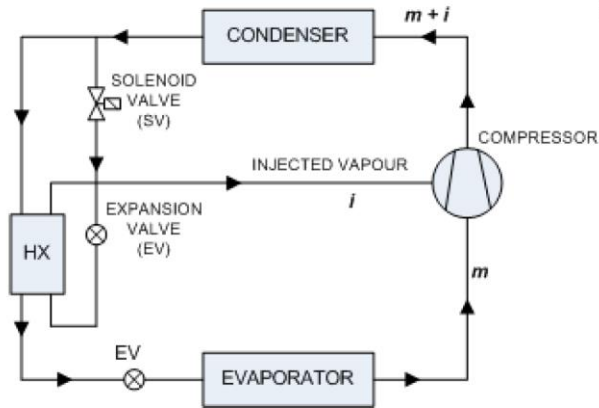


Heat Pump Calibration



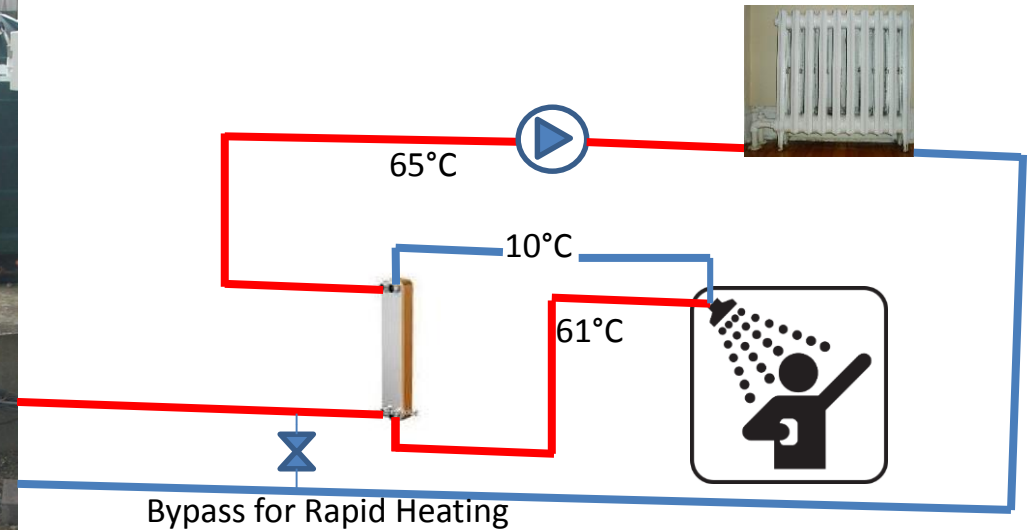
Air source heat pump CoP = 5.1

Optimisation



4s-DHW

“Combination” Air Source Heat Pump



4s-DHW

Research Challenges

There is a relationship between compressor capacity range, household heating demand, hot water demand =>

Household Characterisation => **Target Markets**

RPM versus Watts

