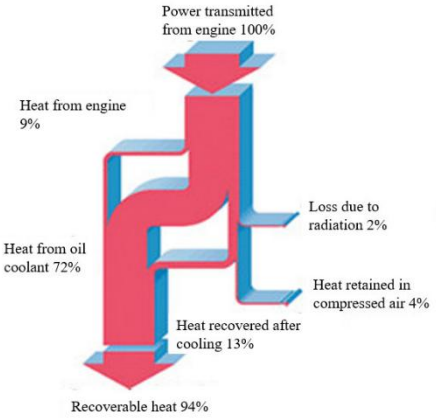
Air compressor heat recovery

1. Understanding of heat recovery/reuse



How much heat from an air compressor can be recovered and reused?

On average, 85% of the energy input can be recovered to use for heating.

- Used in boilers, hot water systems
- No other electric water heaters needed
- Extended machine service life

The recovery heat also depends on:

- The demand for heat of the plant
- The balance between compressor operation and heat demand
- The distance between the compressor station and consumer/heat distribution line

2. Recovery potential calculation

Recovered electricity (kWh/year): $W = [(K_1 \times Q_1 + K_2 \times Q_2)] \times T_R]$

Cost savings (VND/year): $= W \times \frac{G Đ}{\eta}$

In which, T_R: Recovery time (hours/year)

K_1: Recovery time for on-load compressor (hours/year)

K_2: Recovery time for off-load compressor (hours/year)

Q_1: Available coolant power Cooling capacity needed for loaded compressor (kW)

Q_2: Cooling capacity for off-load compressor (kW)

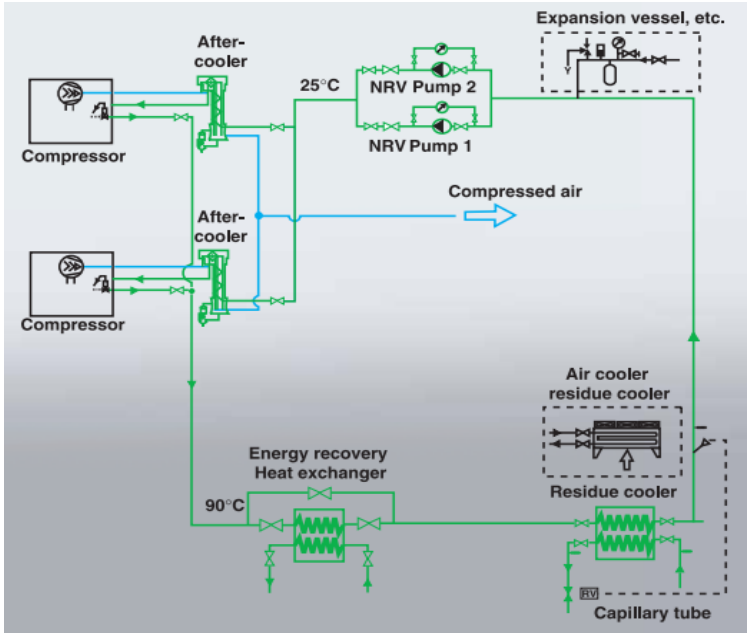
ep: energy price level (VND/kWh)

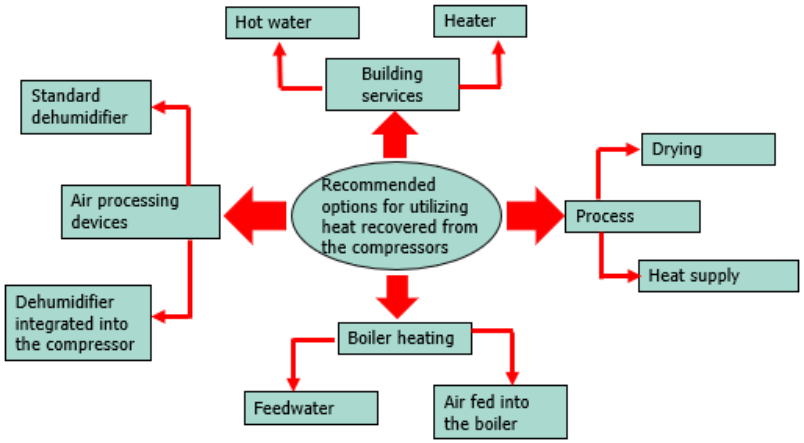
η: average efficiency of heater (%)

3. Heat recovery efficiency

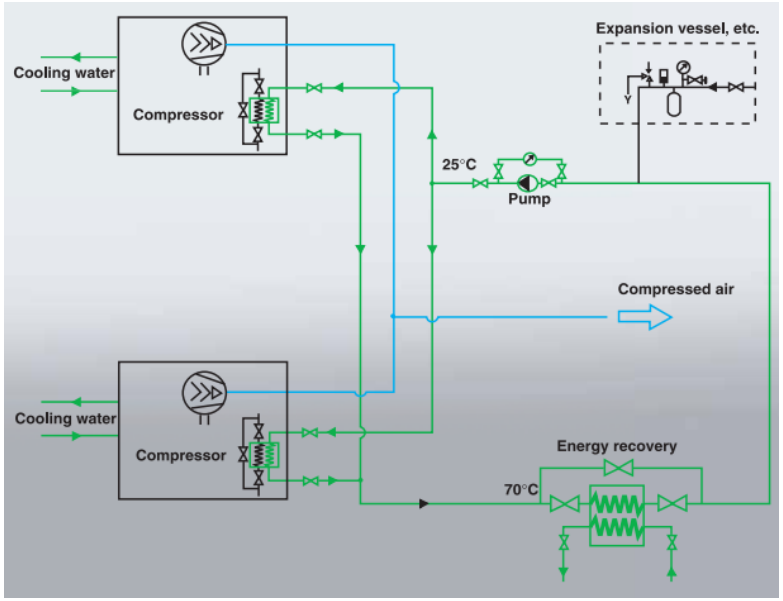
The heat recovery efficiency from air compressors varies depending on the type of compressor:

- Standard oil-free air compressors are easy for upgrading and additional installation of a heat recovery unit. This type of compressor is ideal for integration into hot water supply systems as it provides water up to 90°C, meeting the requirements of an efficient heat recovery system.




Hot water
Heater
Building services
Standard dehumidifier
Air processing devices
Recommended options for utilizing heat recovered from the compressors
Drying
Process
Heat supply
Dehumidifier integrated into the compressor
Boiler heating
Feedwater
Air fed into the boiler

- On oil-lubricated compressors, the oil takes part in the compression process and functions to constrain temperature rise of the cooling water.



- In centrifugal compressors, the water temperature levels are generally lower because of the lower pressure ratio per compression stage, thereby limiting the degree of recovery.

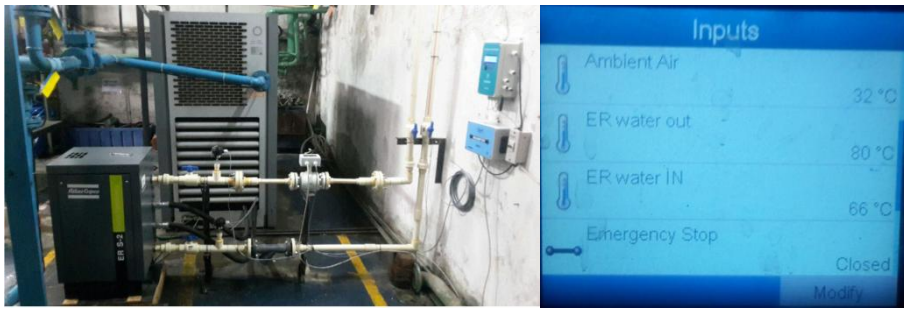
The efficiency of heat recovery also depends on other factors such as the distance to the point of heat consumption, and the degree and continuity of the heating requirement, etc.

4. Solution applied in industrial plants

The recovery of waste heat is of great potential for plants using high heat and should not be overlooked. The recovery of heat from an air compressor has a low payback time, usually only from 1-3 years. In addition, the energy recovered by means of a closed loop cooling system (for water cooled compressors) helps optimize the compressor's operating conditions, increase its reliability and service life thanks to amore balanced temperature level and high quality of the cooling water quality.

Energy recoverable power			
FAD m^3/min	Heat flow kW	Saving at 2000 oper.hours/year kWh/year	Oil EO1 m^3/year
6.4	34	68 000	10.0
7.4	40	80 000	11.8
11.4	51	102 000	15.0
14.0	61	122 000	17.9
18.7	92	184 000	27.1
21.6	109	218 000	32.1
23.2	118	236 000	34.7
27.9	137	274 000	40.3
34.8	176	352 000	51.8
43.1	215	430 000	63.2
46.9	235	470 000	68.1
46.5	229	458 000	67.4
51.3	253	506 000	74.7
56.9	284	568 000	83.5
62.9	319	638 000	93.8
69.7	366	732 000	108
75.4	359	718 000	106
83.2	392	784 000	115
103.6	490	980 000	144
124.5	602	1 200 000	177

Example of the potential of recovering waste heat from an air compressor



Actual heat recovery unit