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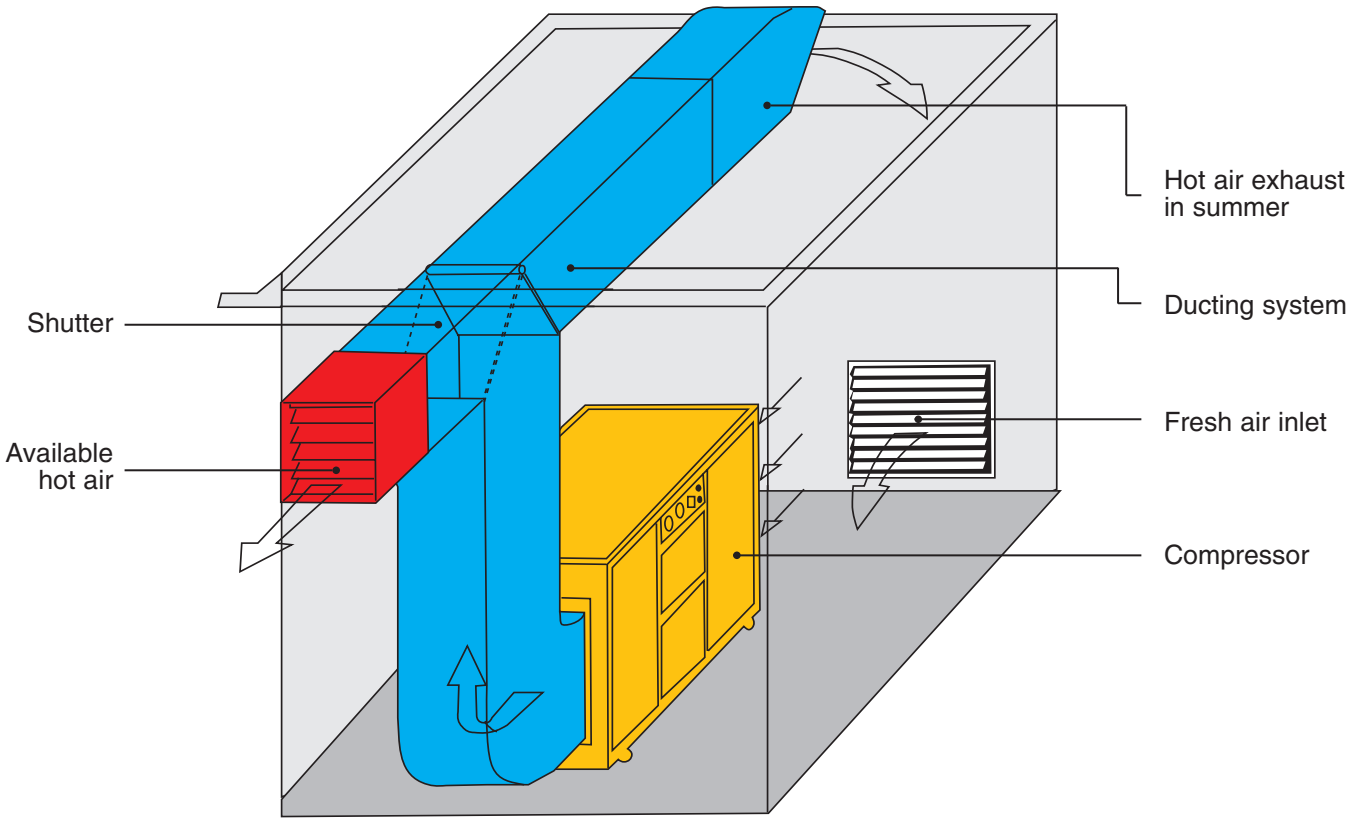
KAESER COMPRESSORS Heat Recovery Systems

PTG, SWT Series

KAESER COMPRESSORS



Space Heating System

Because of the enclosed, compact construction of screw compressors, it is no problem to recover 94% of their overall energy consumption from the cooling air with a ducting system and guide it to where it is needed.

Using this method, the compressor room and adjacent facilities, such as warehouses, workshops, etc. can be heated, either fully or partly.

In summer, when no heating is required, the exhaust heat can be directed to the open air by swivelling a shutter in the ducting.

The movement of the shutter and thus the flow of hot air into the adjacent facilities can be precisely determined by thermostatic control, allowing a constant temperature to be maintained in these spaces.

Applications

- Auxiliary or main heating for warehouses, workshops, etc.
- Drying aid for paint spraying, or washing
- Air curtains
- Improving efficiency of oil burners by heating the combustion air
- Keeping large spaces at moderate temperatures

Rotary screw compressor	Rated motor power	Maximum available thermal power		Useable hot air volume	Cooling air heating	Savings potential over 2000 hours	
						Heating oil	Heating costs
Model	kW	kW	MJ/h	m³/h	K(approx.)	l	€
SX 3	2.2	2.5	9	1100	7	724	181
SX 4	3	3.5	13	1500	7	1014	254
SX 6	4	4.6	17	1500	9	1333	333
SM 8	5.5	6.2	22	1500	12	1796	449
SM 11	7.5	8.4	30	1500	17	2434	608
SK 19	11	12.4	45	2500	15	3593	898
SK 26	15	16.8	60	2500	20	4868	1217
ASD 32	18.5	21.5	77	3800	17	6229	1557
ASD 37	22	25.4	91	3800	20	7359	1840
ASD 47	25	31.1	112	4500	21	9011	2253
ASD 57	30	35.9	129	5400	20	10402	2600
BSD 62	30	35.5	128	5700	19	10286	2571
BSD 72	37	43.2	156	5700	23	12517	3129
CSD 82	45	53	191	8000	20	15356	3839
CSD 102	55	64	230	8000	24	18543	4636
CSD 122	75	79	284	9000	26	22889	5722
CSDX 137	75	94	338	13000	22	27235	6809
CSDX 162	90	106	382	13000	24	30712	7678
DSD 141	75	82	295	9000	27	23759	5940
DSD 171	90	98	353	14000	21	28394	7099
DSD 201	110	118	425	16000	22	34189	8547
DSD 241	132	142	511	21000	20	41143	10286
DSD 281	160	171	616	21000	24	49545	12386
ESD 251	132	137	493	21000	20	39694	9924
ESD 301	160	187	673	28000	20	54181	13545
ESD 351	200	227	817	28000	24	65771	16443
ESD 361	200	210	756	27000	23	60845	15211
ESD 441	250	244	878	34000	22	70696	17674
FS 440	250	269	968	40000	20	77940	19485
GS 580/590	315	30	107	10000	9	8605	2151
GS 640/650	355	34	121	10000	10	9706	2427
HS 690	400	38	136	12000	9	10923	2731
HS 760	450	42	153	12000	11	12285	3071

Heat value of heating oil: 35.5 MJ/l = 9.861 kWh/l
Heating efficiency: 0.7
Price of heating oil: € 0.25 / l

1 kW =1 MJ/h x 3.6

Calculation for an ASD 32: (usable heat energy: 21.5 kW

Cost savings = $\frac{21.5 \text{ kW} \times 2000 \text{ h}}{0.7 \times 9.861 \text{ kWh/l}}$ x € 0.25 / l = € 1557

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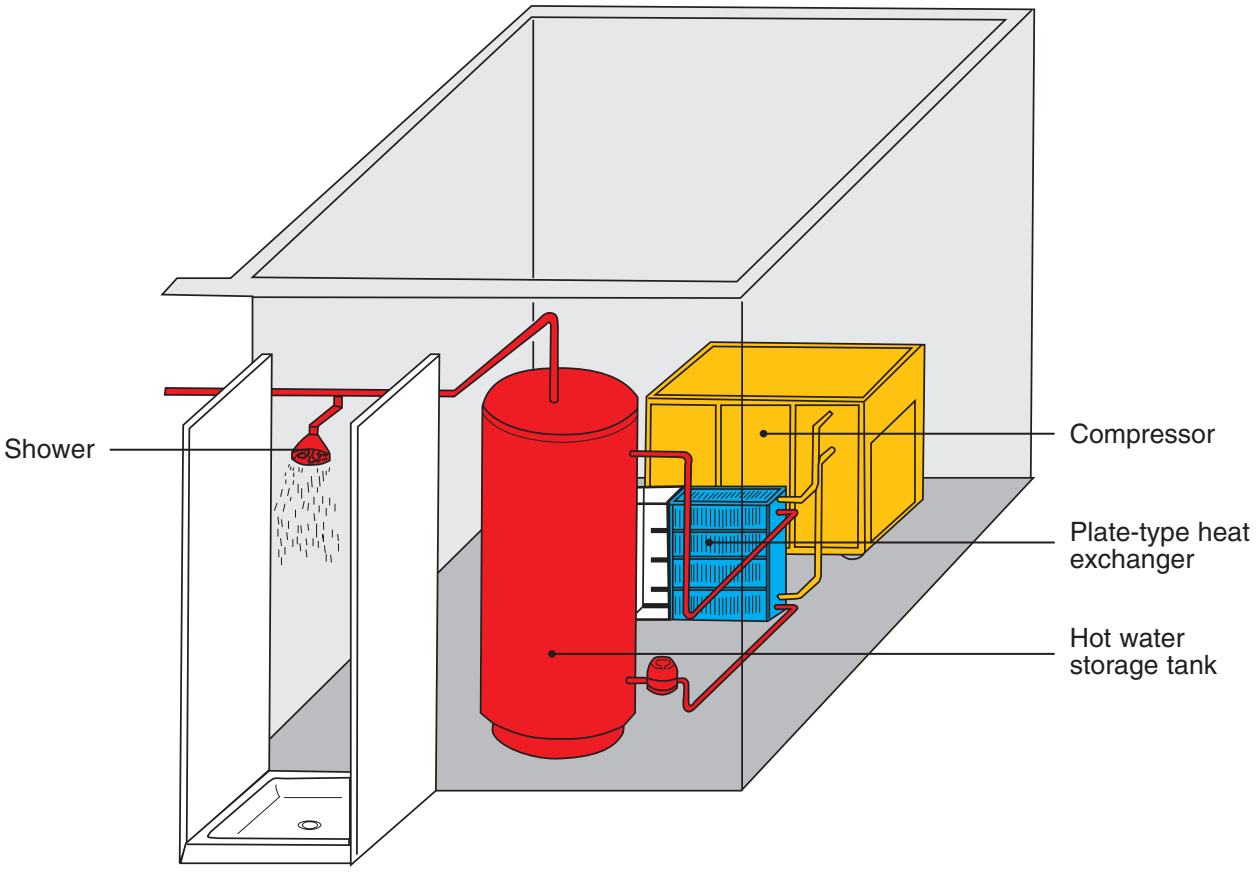

PTG Water Heating System

The PTG heat exchanger consists of a stack of up to 200 individually stamped stainless steel plates, brazed in a vacuum furnace using 99.9 percent pure copper. The plate profile generates a highly turbulent flow within the channels to ensure efficient heat transfer. Every alternate plate is fitted at 180 degrees to the next, providing innumerable contact points right across the heat exchanging surface.

Because of the high temperatures possible (around 80 °C) the system is enclosed in a frame to prevent injury through contact.

The plate-type heat exchanger can produce hot water at about. 70 °C.

If less, or even no hot water is needed, the compressor cooling fluid flow is automatically directed through the standard fluid cooler. Cooling of the compressor is constantly assured whether hot water is required or not.

The system can be easily integrated in any hot water supply plant, especially where it is desirable to avoid mixing water and cooling fluid.

Applications

- laundries, showers, bathrooms and washrooms
- canteens and large kitchens
- food industry
- chemical and pharmaceutical industries
- industrial cleaning processes
- plating processes

Rotary screw compressor	Rated motor power	Maximum available thermal power		Hot water volume Heating to 70 °C (ΔT 25 °C)	Hot water volume Heating to 70 °C (ΔT 55 °C)	Installation	Savings potential over 2000 hours Heating oil	Savings potential over 2000 hours Heating costs
Model	kW	kW	MJ/h	m³/h	m³/h	int./ ext.	l	€
ASD 32	18.5	16.4	59	0.55	0.25	intern	4752	1188
ASD 37	22	19.3	69	0.67	0.31	intern	5592	1398
ASD 47	25	23.9	86	0.83	0.38	intern	6925	1731
ASD 57	30	27.6	99	1.03	0.43	intern	7997	1999
BSD 62	30	27.0	97	0.92	0.42	intern	7823	1956
BSD 72	37	33.3	120	1.14	0.52	intern	9648	2412
CSD 82	45	40.8	147	1.39	0.63	intern	11821	2955
CSD 102	55	49.4	178	1.70	0.77	intern	14313	3578
CSD 122	75	62	223	2.00	0.91	intern	17964	4491
CSDX 137	75	73	263	2.56	1.15	intern	21151	5288
CSDX 162	90	84	302	2.93	1.32	intern	24338	6085
DSD 141	75	65	234	2.20	1.00	intern	18833	4708
DSD 171	90	78	281	2.60	1.20	intern	22600	5650
DSD 201	110	93	335	3.20	1.46	intern	26946	6736
DSD 241	132	114	410	4.30	1.78	intern	33030	8258
DSD 281	160	138	497	4.46	2.02	int.ext.	39984	9996
ESD 251	132	110	396	3.81	1.73	extern	31871	7968
ESD 301	160	146	526	4.69	2.22	extern	42302	10575
ESD 351	200	180	648	5.77	2.62	extern	52153	13038
ESD 361	200	169	608	5.83	2.65	extern	48966	12241
ESD 441	250	197	709	6.70	3.05	extern	57078	14270
FS 440	250	209	752	7.20	3.27	extern	60555	15139
GS 580/590	315	263	947	9.08	4.12	extern	76201	19050
GS 640/650	355	296	1066	10.23	4.65	extern	85763	21441
HS 690	400	334	1202	11.52	5.23	extern	96773	24193
HS 760	450	376	1354	12.97	5.89	extern	108942	27235

Heat value of heating oil: 35.5 MJ/l = 9.861 kWh/l
Heating efficiency: 0.7
Price of heating oil: € 0.25 / l

1 kW =1 MJ/h x 3.6

Calculation for an ASD 32: (usable heat energy: 16.4 kW

Cost savings = $\frac{16.4 \text{ kW} \times 2000 \text{ h}}{0.7 \times 9.861 \text{ kWh/l}}$ x € 0.25 / l = € 1188

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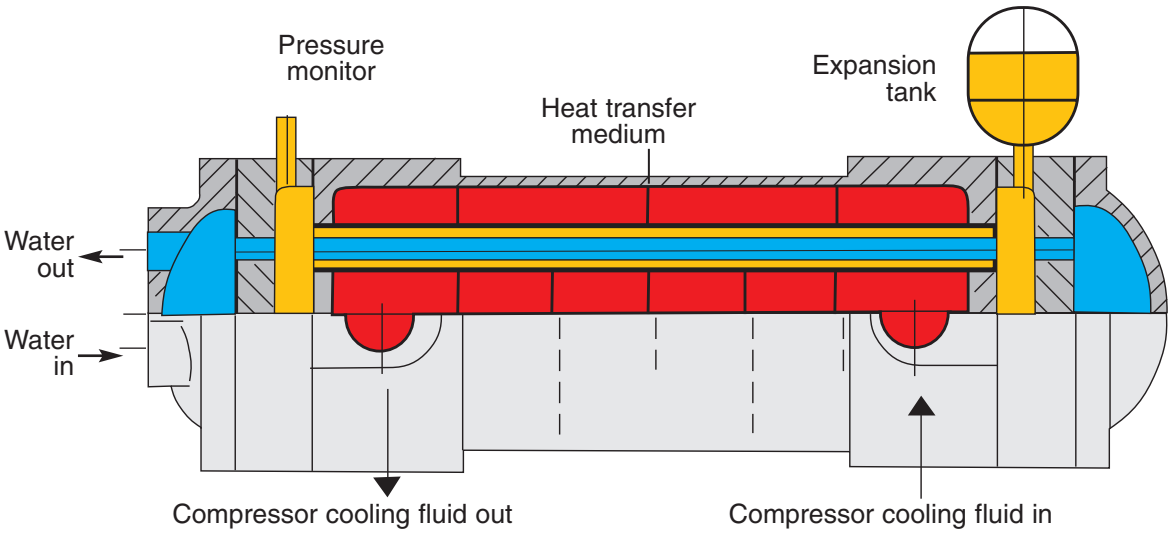

SWT Water Heating System

In the SWT fail-safe heat exchanger one tube is fitted into another such that a space still exists between the two tubes. Both tubes are individually pressed into separate tube end plates. The space is filled with a harmless heat transfer medium kept at a constant pressure by the expansion tank. This pressure is continuously monitored by a pressure switch.

In case of breakage or corrosion. either water or compressor cooling fluid mixes with the heat transfer medium and the pressure increases, actuating the pressure switch, giving an alarm or shutting down the compressor. The fail-safe heat exchanger is piped exactly the same as the plate-type heat exchanger and can produce hot water at about. 70 °C.

If less, or even no hot water is needed, the cooling fluid flow is automatically directed through the standard cooler of the compressor. Cooling of the compressor is constantly assured whether hot water is required or not.

The SWT system is particularly suitable for providing hot water of drinking quality where it is essential that there is no danger of the water being contaminated by cooling fluid.

Applications

- Food industry
- Hot drinking water
- Chemical and pharmaceutical industries
- Canteens and large kitchens

Rotary screw compressor	Rated motor power	Maximum available thermal power		Hot water volume Heating to 70 °C (ΔT 25 °C)	Hot water volume Heating to 70 °C (ΔT 55 °C)	Installation	Savings potential over 2000 hours Heating oil	Savings potential over 2000 hours Heating costs
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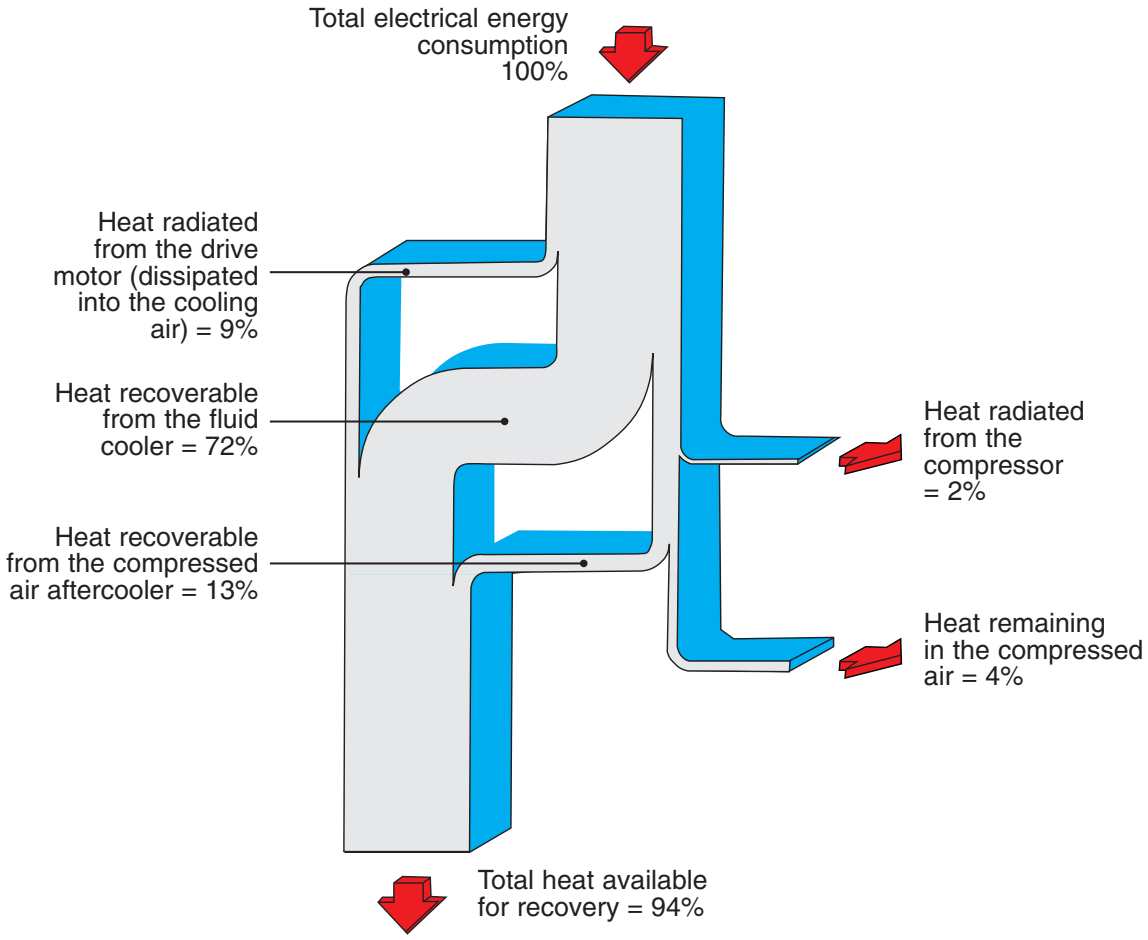

Heat Flow Diagram

Almost all the electrical energy consumed by a compressor is changed into heat. On screw compressors, approximately 94% of this heat is given up to the cooling system, approximately 4% remains in the compressed air and approximately 2% is radiated from the compressor into the immediate surroundings.

Because the low cost of electricity used to be only a small part of operating costs, this wastage was of no great concern and few considered making practical use of the heat produced by compression. Only since the dramatic increase in electricity costs has the recovery of heat from a compressor become an important factor in the planning of an efficient air supply system.

The basic principle lies in the transfer of the heat into a medium and then transporting it to where the heat can be utilised.

The theoretical available heat of a screw compressor is 94% of the overall electrical energy consumption. It consists of heat dissipated in the fluid cooler (72%), the aftercooler (13%) and heat radiated from the drive motor (9%).

An enclosed, air-cooled screw compressor with a precisely defined cooling air outlet would transfer the total amount into the cooling air for **space heating.**

If water is to be heated, the oil in the fluid cooler is chosen as the transfer medium so that only 72% of the overall power consumption is available for **water heating.**

If a **combination of hot water and space heating** is chosen then a maximum of 72% is available for water heating and at least 22% for space heating.

KAESER COMPRESSORS

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