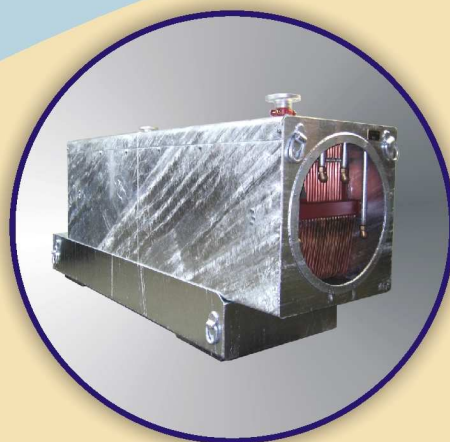




**DIRECT
REFRIGERATING
MACHINES**

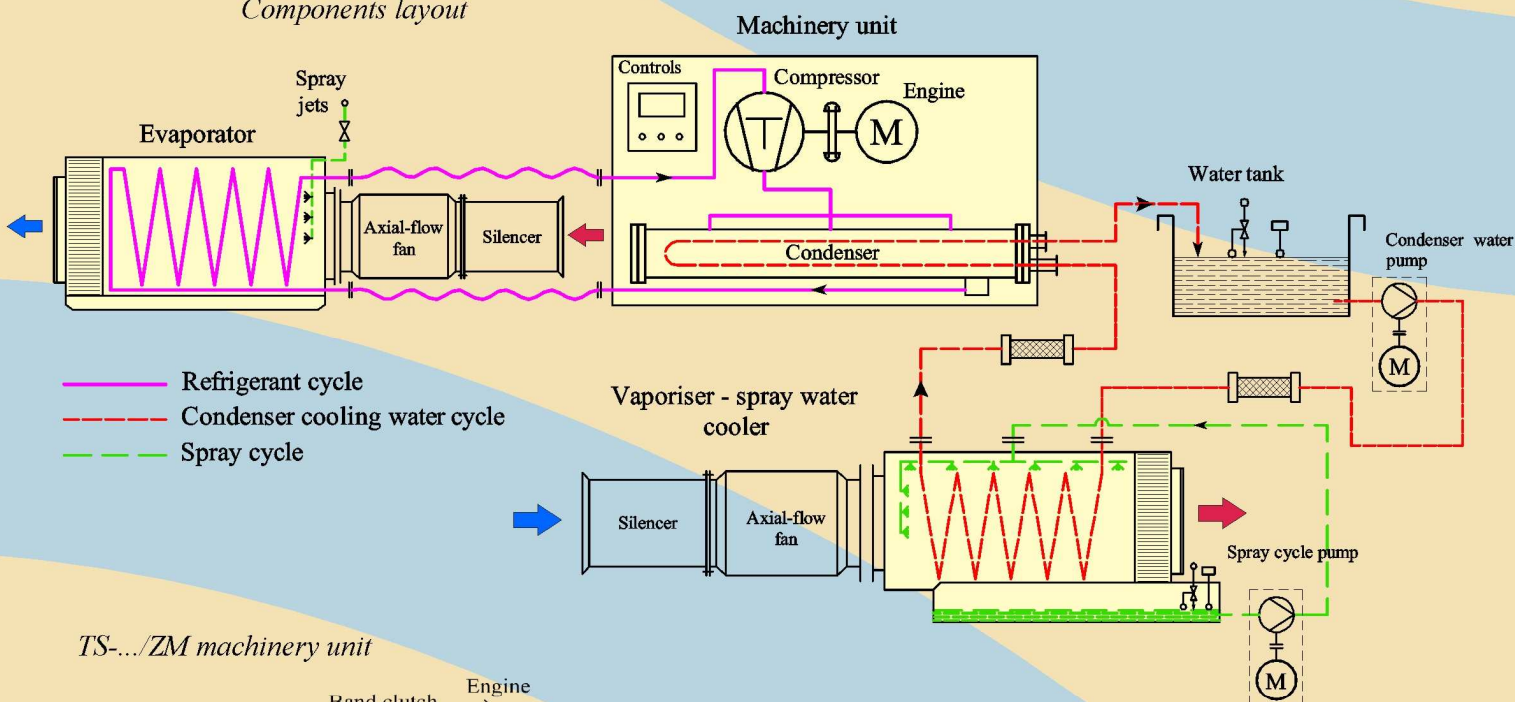
DIRECT REFRIGERATING MACHINES

Direct refrigerating machines rated at 150-400kW are commonly applied in cross-cuts, headings and longwalls of underground coal mines to improve harsh climatic conditions and to fight high temperature hazard. An evaporator is used as a cooler to decrease air temperature. Temperature drop of air flowing through the evaporator ranges from 10 to 14°C. Warm water of the condenser cycle is cooled down in vaporizers (spray water coolers) installed in the used air current. Other solution, such as open refrigeration system can be also used, which means direct refrigeration of condenser with process water.

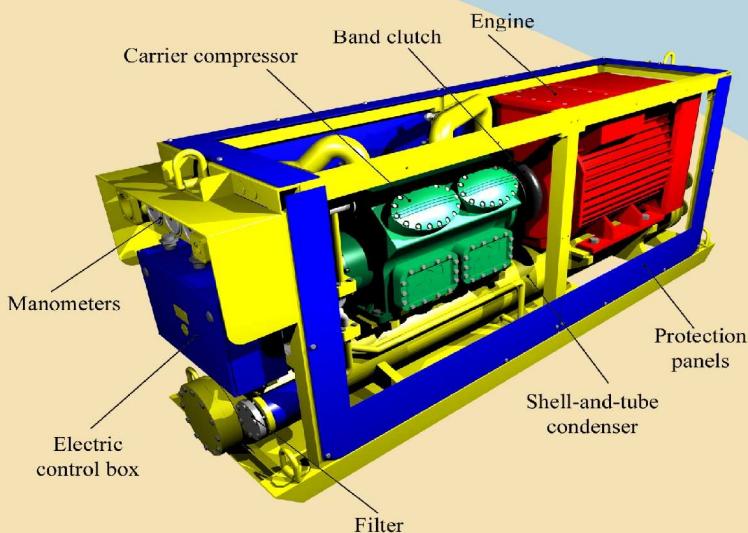
Local direct machines consist of:

- ⇒ A machinery unit equipped with a compressor, an engine and a condenser
- ⇒ An evaporator - an air cooler
- ⇒ A condenser cooling water cycle (open or closed with a vaporizer)

Components layout



TS-.../ZM machinery unit

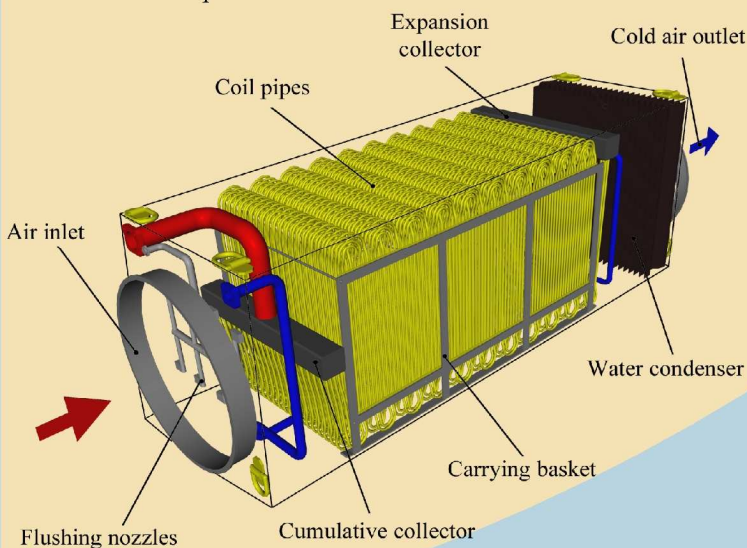


PARAMETERS OF MACHINERY UNITS

Parameters		Machinery unit type					
		TS-150/ZM	TS-200/ZM	TS-250/ZM	TS-300/ZM	TS-350/ZM	TS-400/ZM
Cooling capacity	kW	150	200	250	300	350	400
Refrigerant	HFC	R407C, R404A, R507, R419a, ODP=0					
Dimensions							
Height	mm	1200	1200	1200	1280	1310	1310
Width	mm	800	800	800	820	820	820
Length	mm	2350	2350	2850	3400	3400	3400
Weight	kg	2180	2300	2520	2750	2980	3630
Engine voltage	V	500 or 1000, 50 Hz					
Engine power	kW	55	75	75	90	90	132
Condenser type		Shell-and-tube					
Condenser power	kW	200	250	320	380 or 440	440	560
Cooling system pressure	-	max 40 bar					
Condenser cooling system	-	Open or closed with water filtration					
Control system	-	Spark-proof E(E)xi,I or E(E)xi,I, standard SSZ-i/TB-E or microchip-based MSZ-TS-0*					

The machinery unit forms a compact construction highly resistant to rugged conditions of headings. It is a portable device that can be easily moved as a longwall advances.

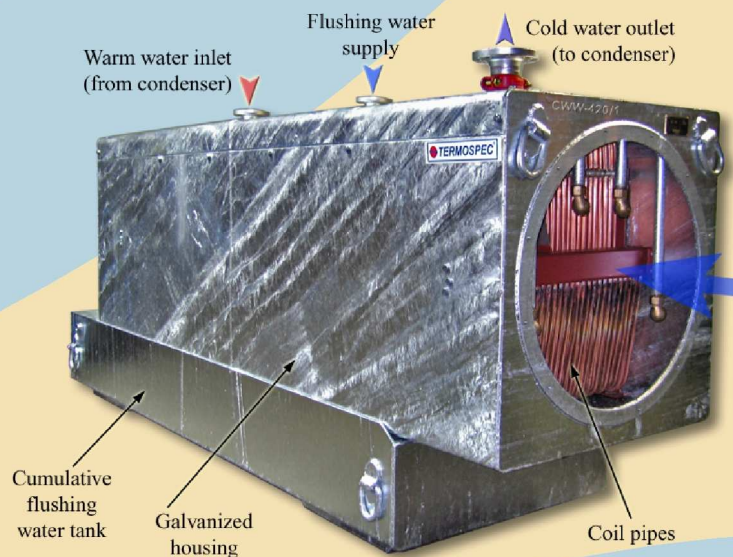
Direct evaporator



PARAMETERS OF DIRECT EVAPORATORS

Evaporator type		TS-150/PB	TS-200/PB	TS-250/PB	TS-300/PB	TS-350/PB
Cooling capacity	kW	150	200	250	300	350
Dimensions						
Height	mm	930	1050	1050	1050	1050
Width	mm	860	820	860	900	900
Length	mm	2610	1610	2770	2900	2900
Weight	kg	1350	1400	1450	1600	1700
Air flow	m³/s	4,5	6	7,5	10	12
Air pressure drop	Pa	800	800	900	1000	1100
Maximal pressure in the refrigerant circuit: 2,5 MPa						
Flushing nozzles supply from the fire protection system: 1,6 MPa						

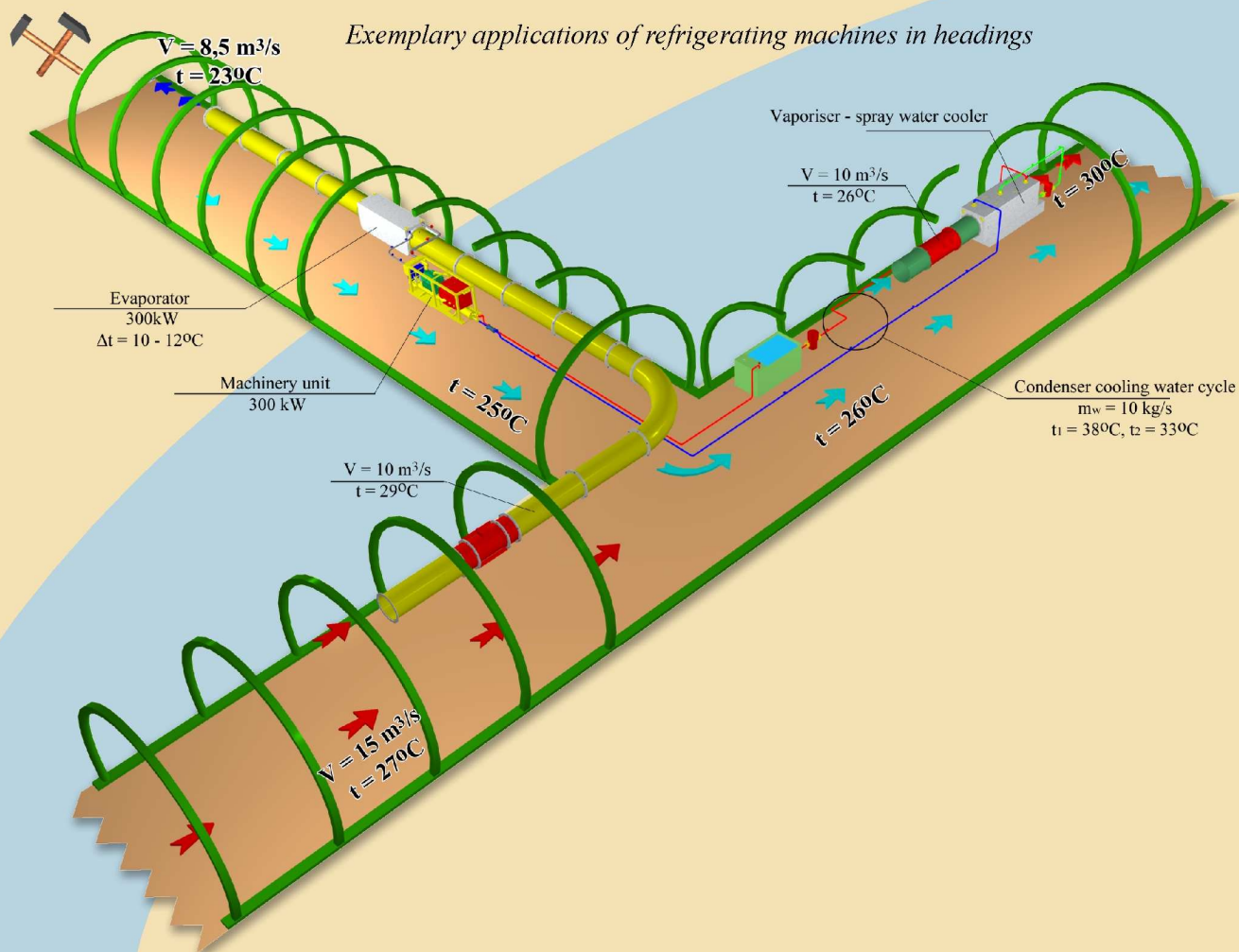
CWW-... vaporiser - spray water cooler



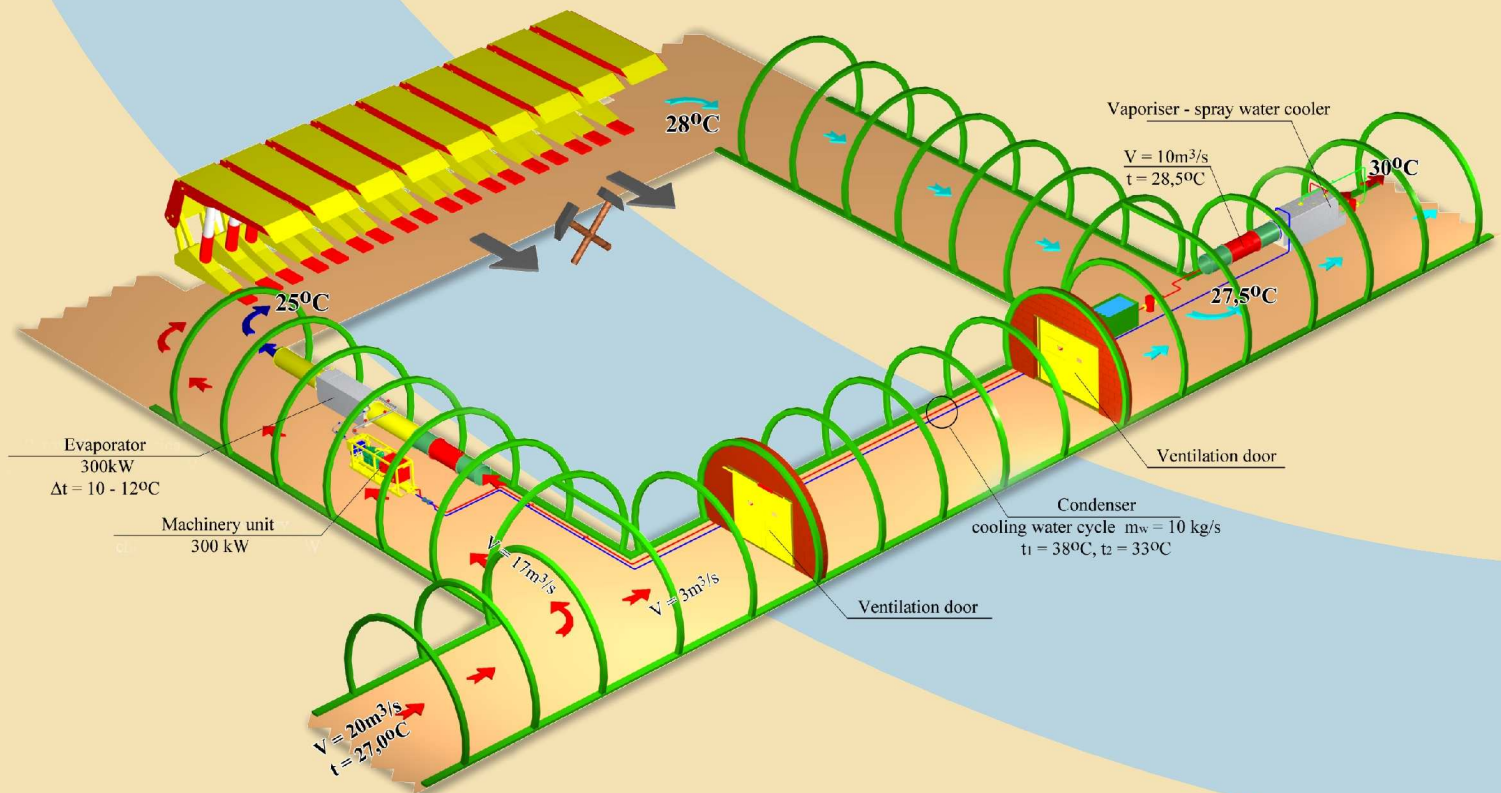
PARAMETERS OF VAPORISERS - SPRAY WATER COOLERS

Parameters		Vaporiser-spray water cooler type			
		CWW-300(1)	CWW-420(1)	CWW-460(1)	CWW-600
Cooling capacity	kW	300	420	460	600
Height	mm	1600	1700	1700	1750
Width	mm	900	1200	1200	1220
Length	mm	3550	3650	3650	3550
Weight	kg	1850	2650	2740	3850
Air flow	m³/s	7,5	10	10	12
Water flow	kg/s	5÷10 (18÷36m³/h)	10 (36m³/h)	10 (36m³/h)	7,5÷15 (27÷54m³/h)
Maximum pressure in the cooling system: 4,0 MPa					
Maximum pressure in the flushing nozzles supply system: 1,6 MPa					

Exemplary applications of refrigerating machines in headings



Exemplary applications of refrigerating machines in longwalls



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