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A collection of short pointed topical papers.

Cold W·A·R·

Whether it's Air Conditioning or Refrigeration

SPORLAN

Large Tonnage Process Cooling

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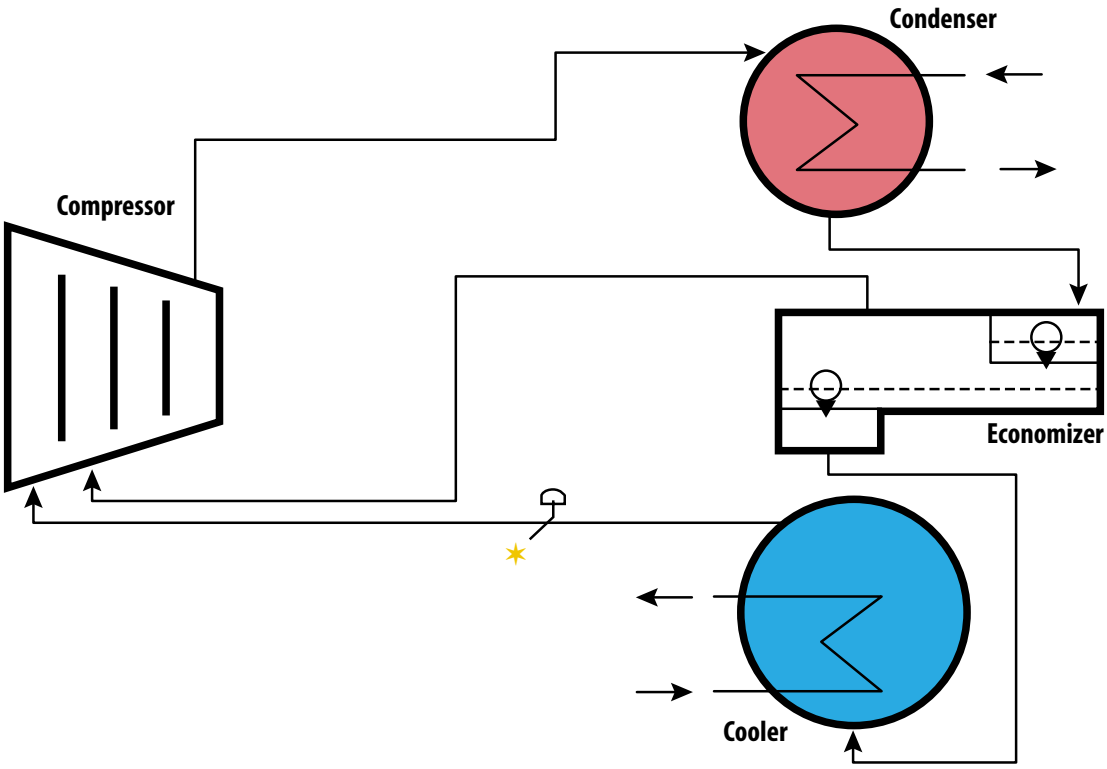
Cold W.A.R. Issue 057

Single Temperature Level

Compact Arrangement With Water Cooled Condensing

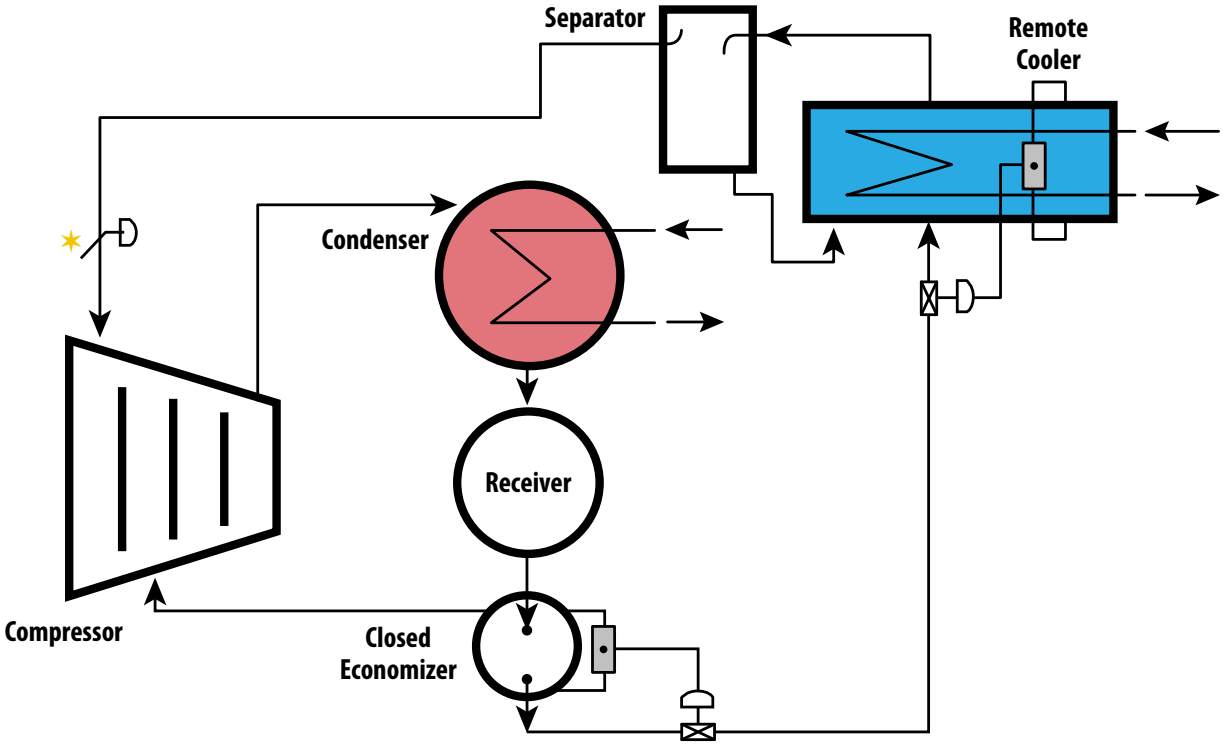


✶ Motorized Butterfly Damper / Temperature Controller

This refrigeration cycle is commonly used when all process loads require approximately the same temperature level. With a standard centrifugal refrigerating machine a two stage compressor can produce temperatures in the range of plus 20°F, three stages of around minus 10°F, and four stages down to approximately minus 40°F to 50°F. Between stages, economizers may be added to reduce horsepower requirements by improving cycle efficiency. In this cycle arrangement, the standard process centrifugal machine operates on a balanced refrigerant charge and thus does not require an operating receiver.

Single Temperature Level

Remote Cooler With Water Cooled Condensing

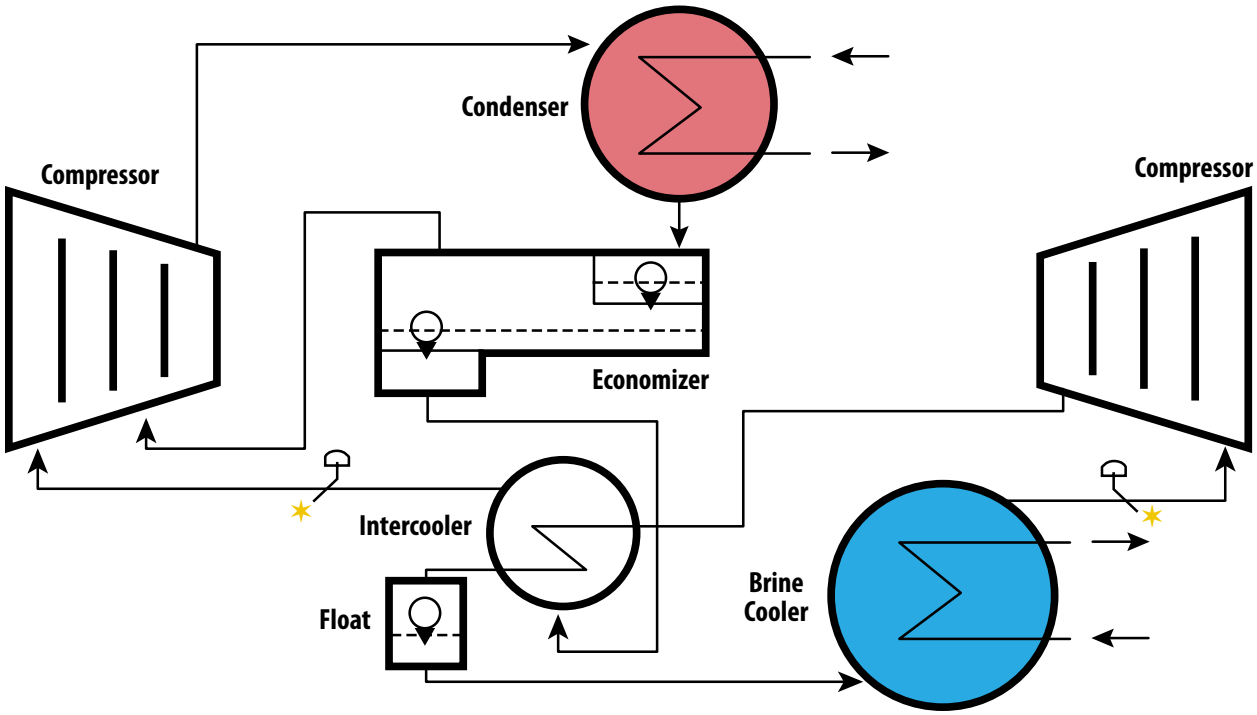


✶ Motorized Butterfly Damper / Temperature Controller

There are times when the refrigerating machine must be located remotely from the process refrigeration requirement. Normally this would be handled by cooling a brine and circulating it to the process heat exchanger. Sometimes it can be handled by adding a closed economizer to the refrigeration system. This sub-cools the high pressure condensed refrigerant enabling it to be transferred by its own pressure to a remotely located evaporator. A separator should be added on the suction line to prevent liquid from being carried over to the compressor during start up or large fluctuations in load.

Single Temperature Level (Low)

Compact Arrangement with Water Cooled Condensing

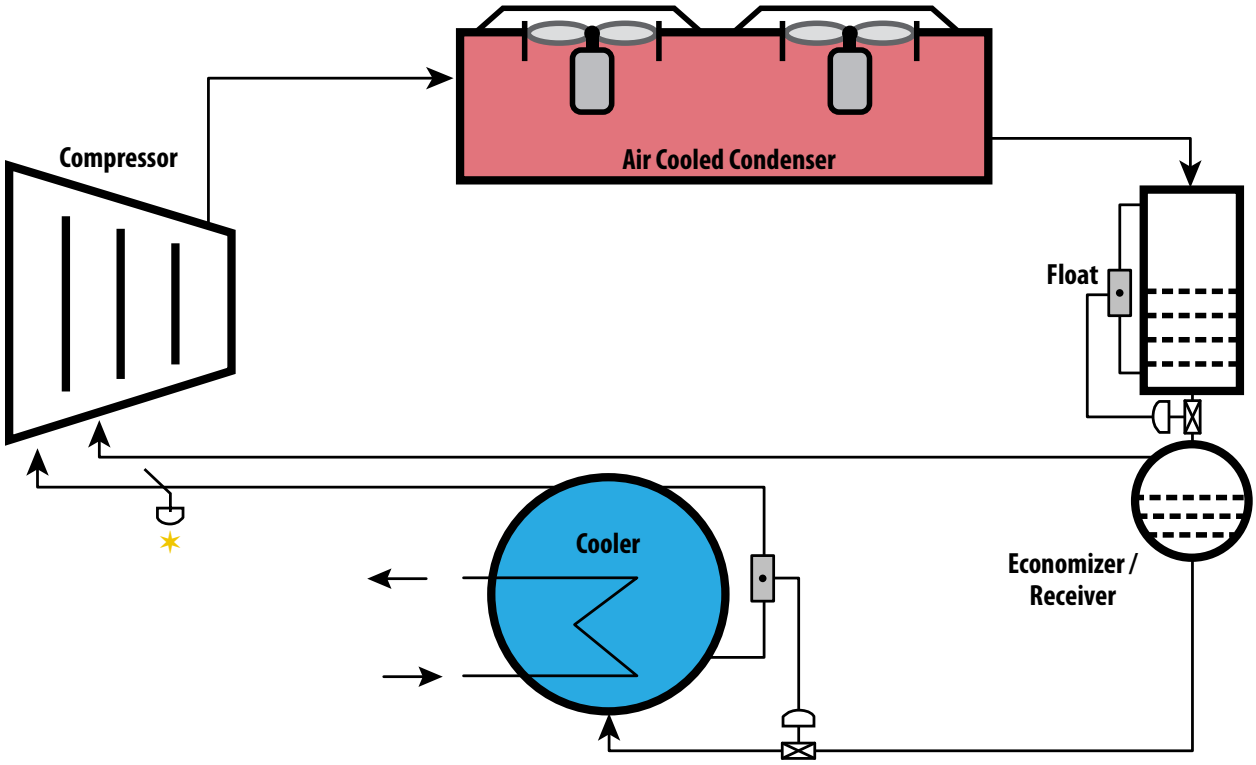


✶ Motorized Butterfly Damper / Temperature Controller

The operating simplicity and reliability of this cycle make it especially suitable for low temperature applications. Temperatures as low as minus 125°F suction can be obtained by cascading two centrifugal refrigerating machines. The inter-cooler condenses refrigerant from the low stage machine. Since two standard machines are used, each operating on a balanced refrigerant charge, no operating receivers or level controls are needed. Different refrigerants may be used in each machine, depending upon process temperature level requirements.

Single Temperature Level

Separate Components With Air Cooled Condensing

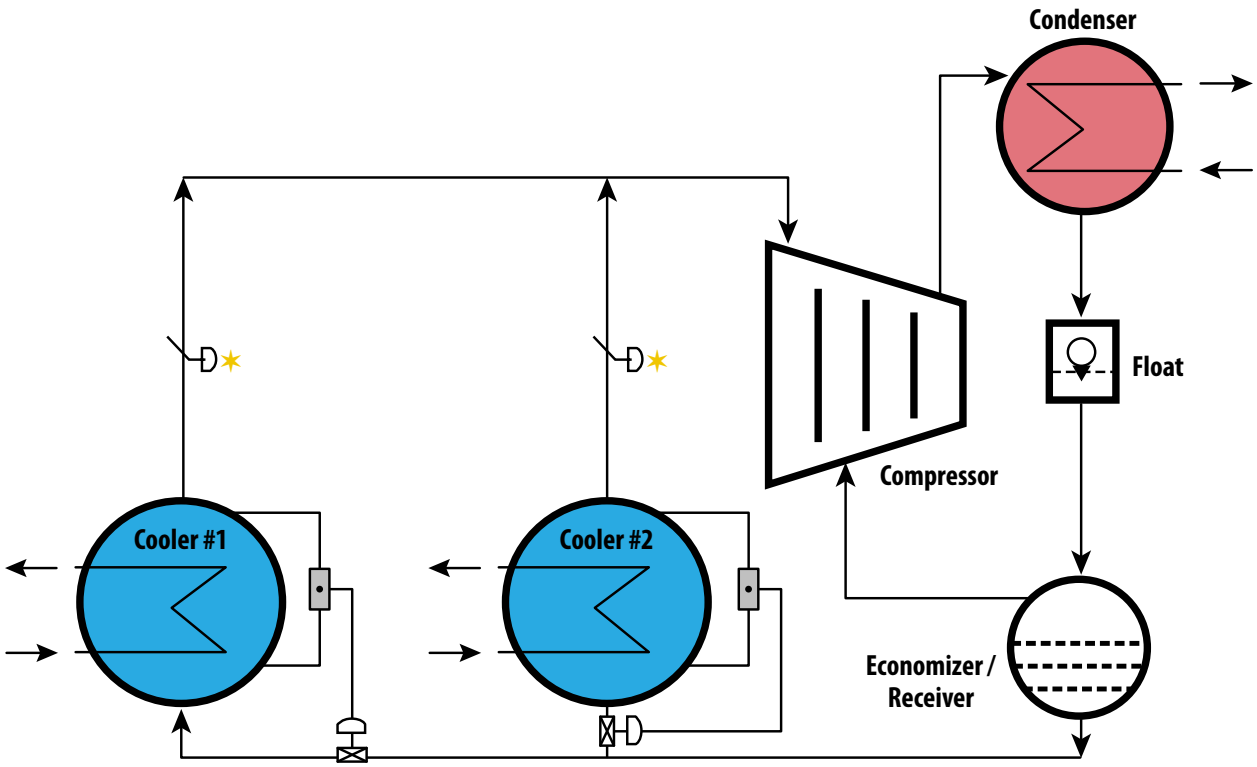


✶ Motorized Butterfly Damper / Temperature Controller

When water for condensing is scarce, restricted, or of poor quality, air cooled condensers for process heat rejection can be used. Air cooled condensing may be applied with any of the commonly used refrigerants such as R-123, R-134a and R-404A. The choice of refrigerants generally depends upon the process load and temperature levels. Normally, this arrangement of separated components requires the addition of a refrigerant storage tank and a liquid level controller on the cooler. The refrigerant receiver may be utilized as an economizer during operation.

Dual Temperature Levels

Separate Components With Water Cooled Condensing

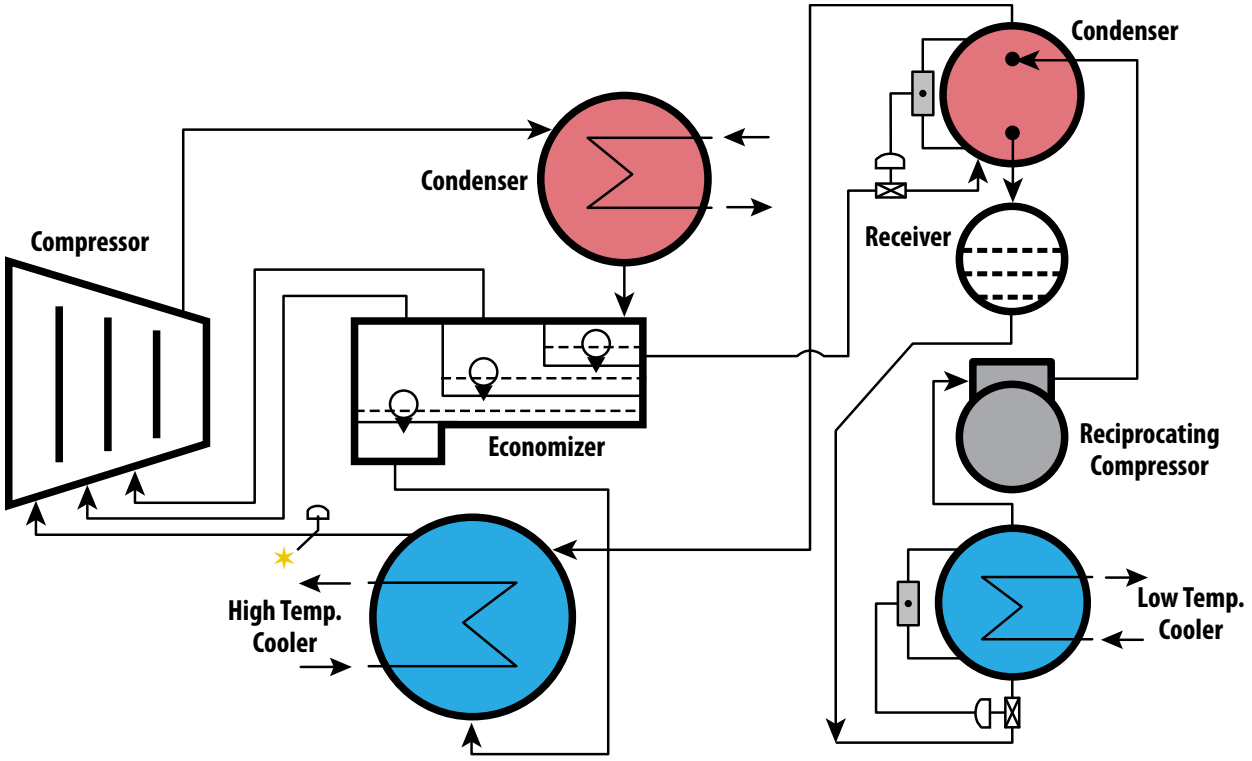


✶ Motorized Butterfly Damper / Temperature Controller

Where more than one temperature level is required in a process refrigeration cycle, the centrifugal machine may serve several coolers, each equipped with independent controllers. With this arrangement, an operating receiver and refrigerant level controls are required. The receiver also serves as an economizer during operation and for the refrigerant storage on shut down. On multi-temperature applications, the effects of varying loads and operating periods should be given consideration to determine if the process requirements can be handled by a single machine more effectively than by two.

Dual Temperature Levels

Separated Components With Booster Compressor, Water Cooled Condensing

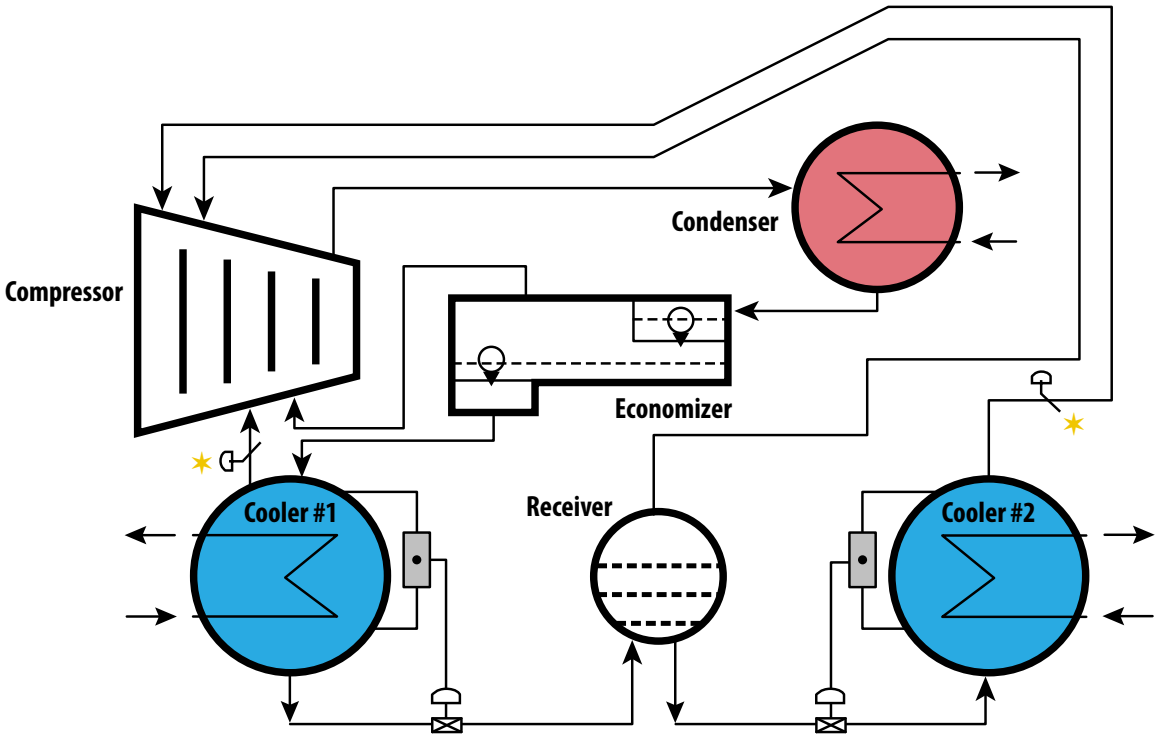


✶ Motorized Butterfly Damper / Temperature Controller

In vapor condensing, such as chlorine, the process stream is usually handled at two different temperature levels, requiring a high and a low stage system. Refrigeration for the high stage or major part of the load is usually handled by a standard centrifugal machine for temperatures down to approximately 0°F. At this level, "tail gas" is reduced to a much lower temperature for maximum recovery. Here a reciprocating system may be used to handle the relatively smaller refrigeration load. Different refrigerants may be used, and refrigerant from the high stage machine is used in the condenser of the low stage.

Dual Temperature Levels

Compact Arrangement With Water Cooled Condensing



✶ Motorized Butterfly Damper / Temperature Controller

This scheme illustrates the possibility of obtaining two considerably different temperature levels for refrigeration duty utilizing only one standard multi-stage centrifugal compressor. For example, with this arrangement the cooler of the centrifugal machine may be chilling water to plus 40°F, and a separate or remote cooler may be chilling brine to minus 20°F. Each cooler has its own temperature controller. This system utilizes an operating receiver in the refrigerant circuit to accommodate fluctuating loads in the two coolers, and it is also used to store refrigerant on shut down.