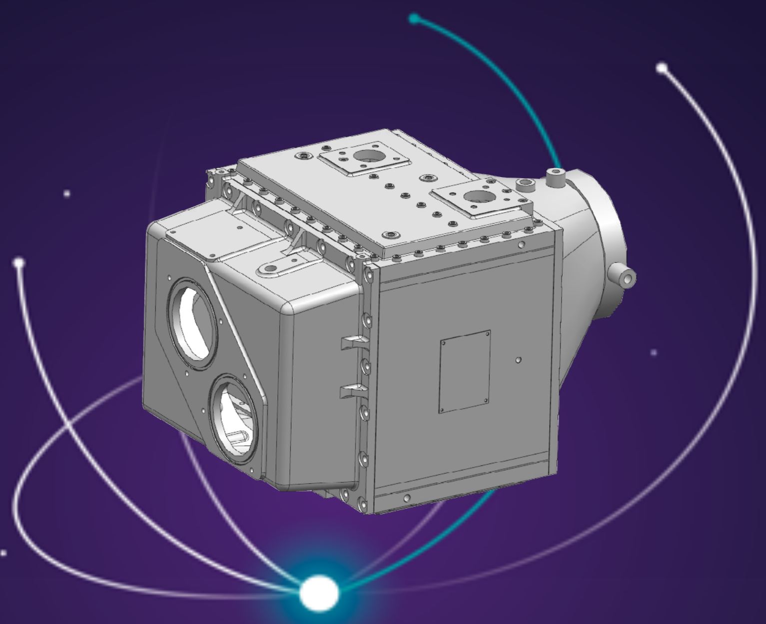
SIEMENS energy

Double-stage Intercooler for V engines



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Background

Single-stage intercooler, i.e. an intercooler cooled only by auxiliar cooling water circuit, are not hydraulic connected with high temperature circuit, from where it is possible to obtain thermal power for consumers like facilities or industrial thermal process where the engines are installed.

Taking into account the considerable number of V engines operating under this configuration, Siemens Energy developed an upgrade kit to implement a modern double-stage intercooler which allows the engine to provide additional thermal power to consumers.

Product Overview

In gas engines the intercooler is used to cool the air-fuel mixture before injecting it into the combustion chamber, Mechanically, the double-stage intercooler is built to be partially cooled by the high temperature circuit and the other part by the auxiliary cooling circuit of the engine as can be seen in the figure 1.

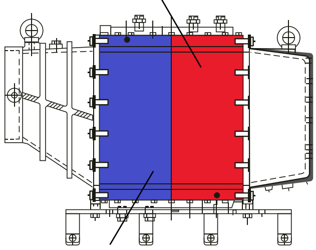

Figure 1 Double-stage intercooler

In this type of intercooler the heat of one of the stages is transferred to the high temperature circuit of the engine, increasing the available heat.

Application

The kit is available for all V engines of F and S series composed by single-stage intercooler.

The following schemes (figures 2 and 3) show how would be the transformation of an engine with single-stage to double-stage intercooler.

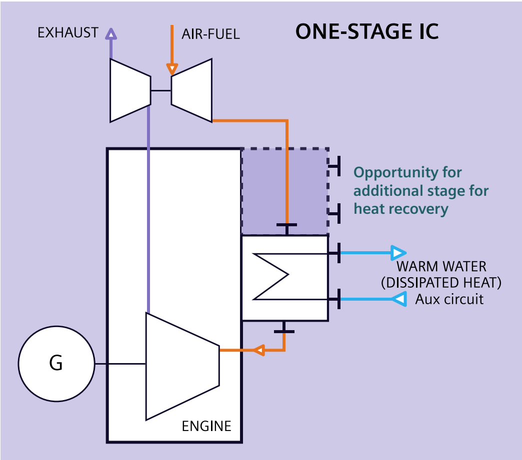

Figure 2 Scheme before the implementation

A previous verification of the existing installation shall be performed to assure that there are no mechanical interferences to implement the kit in the engine and also check that the additional power can be absorbed by the facilities' thermal process.

After the modification here is how the engine cooling scheme would be like:

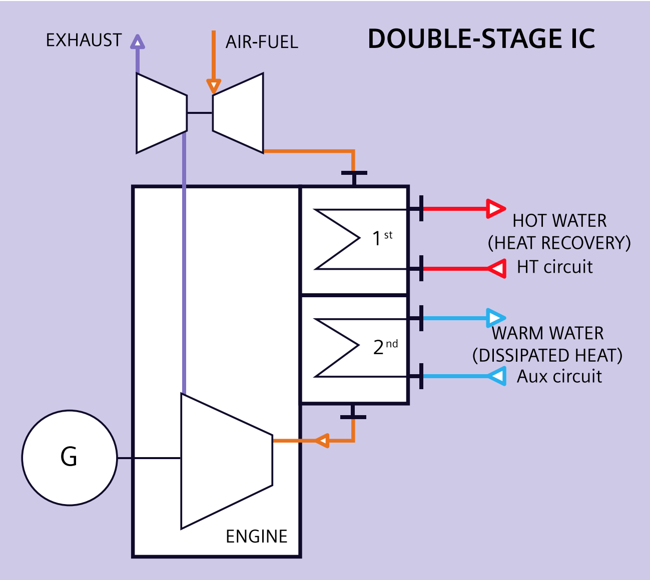

Figure 3 Scheme after the implementation

Benefits

The main benefit of this solution is the increase of thermal power available in the high temperature circuit, useful for the thermal process where the engines are installed (steam production for industrial applications, WWTP, district heating, etc.).

This thermal power increase can reach up to 15% depending on the engine type.

As shown in the following example, after the implementation of the kit part of the thermal power out of the 2nd stage (cooled by the auxiliary circuit) is transferred to the 1st stage and afterwards to the high temperature circuit.

485L @ 1500rpm Natural Gas	1 stage I/C 100% load	2 stage I/C 100% load
Heat in HT circuit [kW]	529	604
Heat in intercooler 1st stage [kW]]	-	75
Heat increase [%]	-	14%
Heat in auxiliary circuit [kW]	210	135
Heat in intercooler 2nd stage [kW]	122	47
Heat in oil cooler [kW]	88	88
Total heat [kW]	**739**	**739**

Figure 4 Heat balance for a SGE-48SL

75 kW is added to the previous 529 kW in the high temperature circuit, totalizing 604 kW.

It is 14% of thermal power increase at nominal load.

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