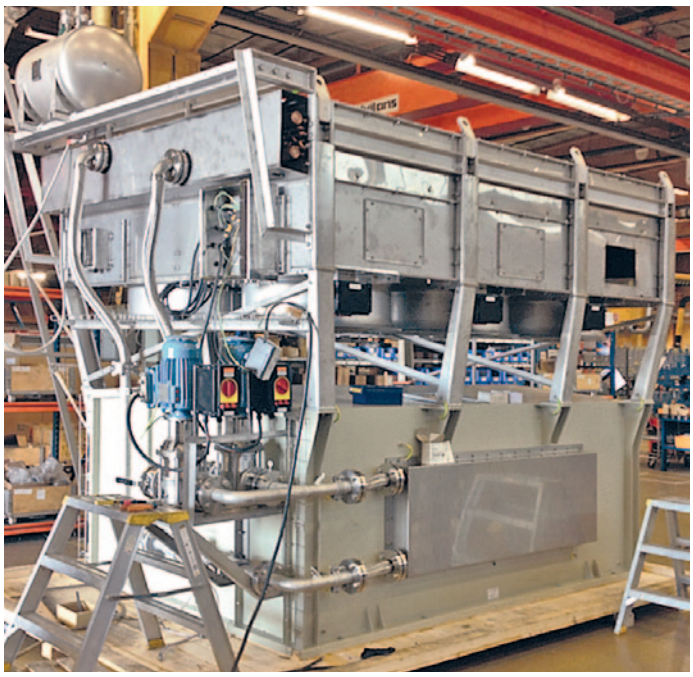
Technical note
Synchronous generators for steam and gas turbines
Smart CAWA cooler for compact gensets

ABB's innovative CAWA cooler is an independent closed circuit cooling system for generators. It is designed for demanding applications such as the oil and gas industries, where space limitations are a key issue. This smart cooler concept uses an additional water-to-air cooler integrated on top of the generator's air-to-water heat exchanger. The new space-saving CAWA cooler enables higher generator power and shorter lead times.



Totally enclosed generators use either air-to-air or water-to-air type heat exchangers for cooling. Water coolers (CACW) offer the best efficiency, but they can only be used if there is a separate cold water system available on site.

Higher power output and shorter lead times

Previously, in places where cooling water supply was not available, less efficient and more expensive air-to-air cooling (CACA) had to be used. This also meant long lead times.

To address this need, ABB developed the CAWA cooler, a compact integrated water cooling package that offers up to 60% weight reduction compared to CACA cooling.

Now it is possible to upgrade installed open ventilated or air-air cooled generators by fitting a CAWA cooler. The efficiency of the CAWA cooler means there will be only a minor – or even zero – reduction in power.

This innovative solution utilizes standard components to build an independent, closed circuit cooling system mounted on top of the generator.

CAWA stands for **C**ooling from **A**ir to **W**ater to **A**ir (i.e. from primary internal air circuit to secondary closed water circuit to ambient air – IC 8A1W7).

CAWA cooler reduces turbine package size

Placing a small-sized CAWA cooler on top of the generator offers many benefits over the much larger CACA air cooler.

It enables higher maximum output powers from each generator frame size and provides a cost saving design with shorter manufacturing lead times.

OEMs can use their standard turbine skids for higher powers, because the same generator size can be used for wider power levels. This boosts the turbine generator set's performance and economy.

Offshore, the compact CAWA cooler can easily cope with wind loads. It runs on low power, unlike the main water pump that an emergency generator cannot operate during a black start.

Major benefits:

- Higher standard genset powers
- Compact turbine package
- Cost saving system
- Short lead times

Safe area and ATEX/CSA certified solutions

CAWA coolers consist of three sub-systems

1. Air Blast Cooler (CACW). This water heat exchanger has six fans to cool down the water coming from the Machine Cooler – the generator secondary cooling circuit's water cooler.

The fans can be operated by a temperature controller (not included) that monitors the generator's internal air temperature. This saves energy by running only as many fans as needed. One of the fans is reserved for 20% redundancy.

2. Machine Cooler (CACW). This water heat exchanger cools down the internal air in the generator's primary cooling circuit. The generator uses its own shaft mounted fans to circulate the hot internal air through this water cooler.

3. Piping System. Includes two pumps for 100% redundancy and circulates the cooling medium (water/30% ethylene glycol mixture) between the two cooler units.

Innovative cooler construction, IC 8A1W7

The cooler comes in two versions, standard for safe areas and premium for ATEX/CSA certified Zone 2, ExnA requirements.

The versions differ in the use of special materials and protection needed in offshore and other demanding conditions.

Standard, safe area design

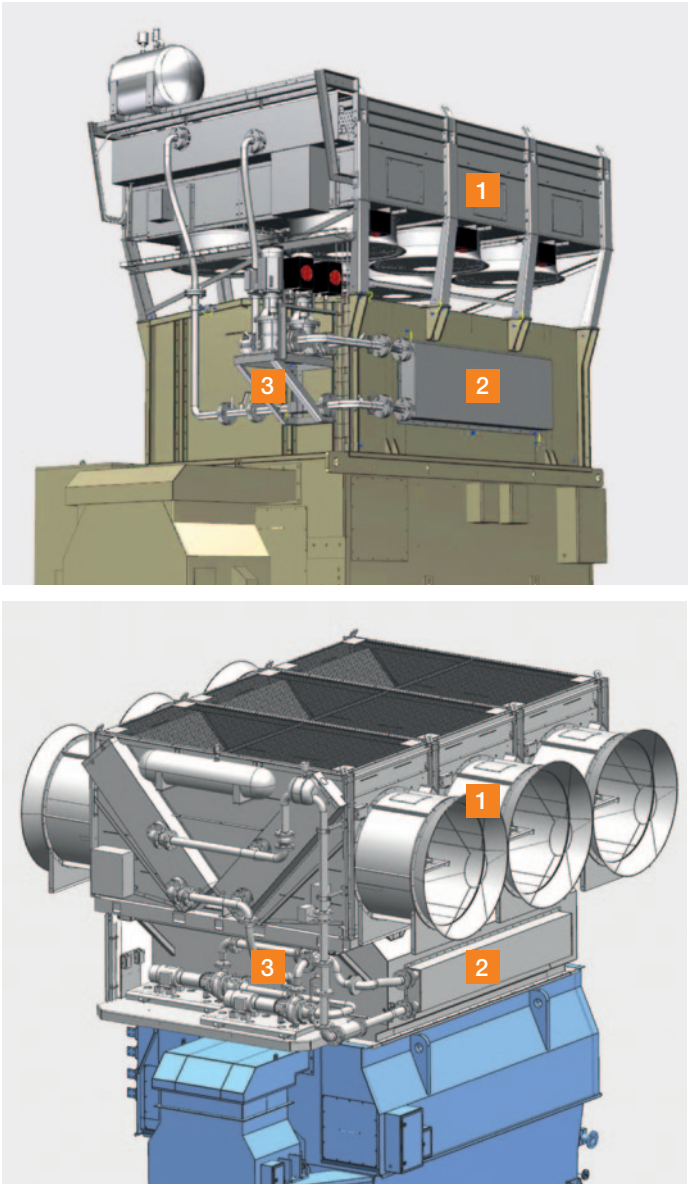
- Protection: IP 54
- Ambient temp.: -20°C … +55°C
- Outer covers: hot galvanized steel/Aluzink
- Fins/tubes in air blast cooler: aluminum/copper
- Fins/tubes in machine cooler: aluminum/copper
- Piping system: AISI 304
- Cooler hood: painted C3

Premium, ATEX/CSA certified design

- Zone 2, ExnA or Class 1 div II
- Protection: IP 55
- Ambient temp.: -20°C … +55°C
- Outer covers: acid proof stainless steel AISI 316L
- Fins/tubes in air blast cooler: copper/copper
- Fins/tubes in machine cooler: aluminium/copper
- Piping system: AISI 316L
- Cooler hood: painted C5M

The cooler is supplied as a separate unit. Small CAWA coolers typically weigh 3,500 kg, large units 9,000 kg in total, including the cooling medium. This is considerably less than a comparable air-to-air cooler, which typically weighs 30 to 70% more. The CAWA cooler also has a much smaller volume and footprint.

ABB has patent protection for the CAWA cooler concept.



Generator with top-mounted CAWA cooler. The upper part is the additional air-to-water cooler with six fans.

For more information please visit:
www.abb.com/motors&generators

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