

The ABCO Subsea SEM Cooling System

Background

In May of 2009, deckhands on a rig in the Gulf of Mexico noticed their Subsea Electronic Module (SEM) would overheat when the rig's BOP stack was brought above water for routine maintenance. While in use on a BOP stack, the SEM was kept cool by the surrounding seawater. But when the BOP stack was brought above water, the SEM on this rig would exceed its maximum operating temperature of 140°F. On this rig, operated by a major North American drilling company, the SEM's temperature was regularly reaching 160°F.

In an attempt to keep the SEM from overheating and prevent damage to its components, workers on the rig ran a water hose to the BOP stack and held a stream of water against the top of the SEM. According to deckhand measurements, this procedure could lower the SEM's temperature by as much as 12°F over the course of 30 minutes, but it created hazardous working conditions under the BOP stack.

The Solution

ABCO Subsea was contracted to design and test the industry's first SEM Cooling System, a polyurethane shell that fits over the rig's SEM housing while water cools the SEM.

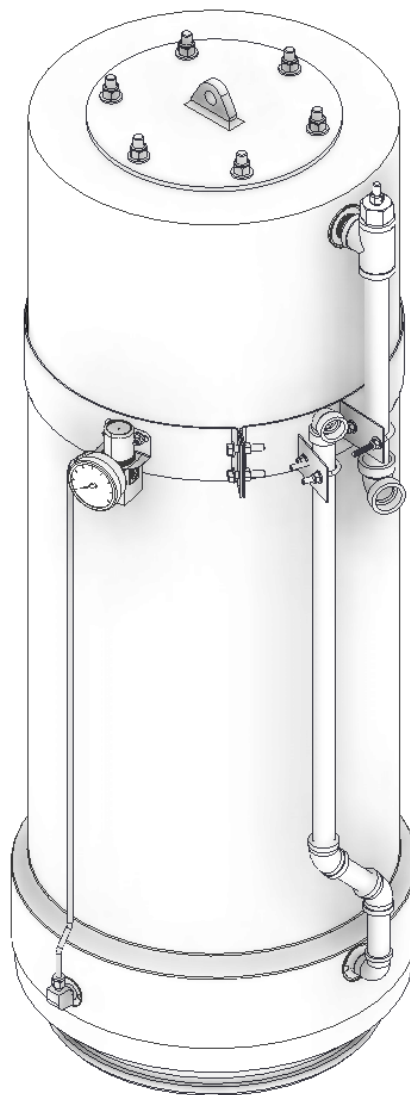
A packoff seal on the bottom of the SEM Cooling System prevents the water from leaking, eliminating the water hazard created by the previous method. A ¾" hose is attached to an inlet and 70°F water swirls around the SEM at a recommended flow rate of 4.25 gallons per minute.

The water fills the inside of the SEM Cooling System before flowing through an outlet at the top of the shell. Another hose is connected to the outlet, and the water is directed away from the deck.

Qualification Testing

The SEM on the rig had a maximum heat output of 468 Watts during normal working conditions in the field, according to manufacturer specifications.

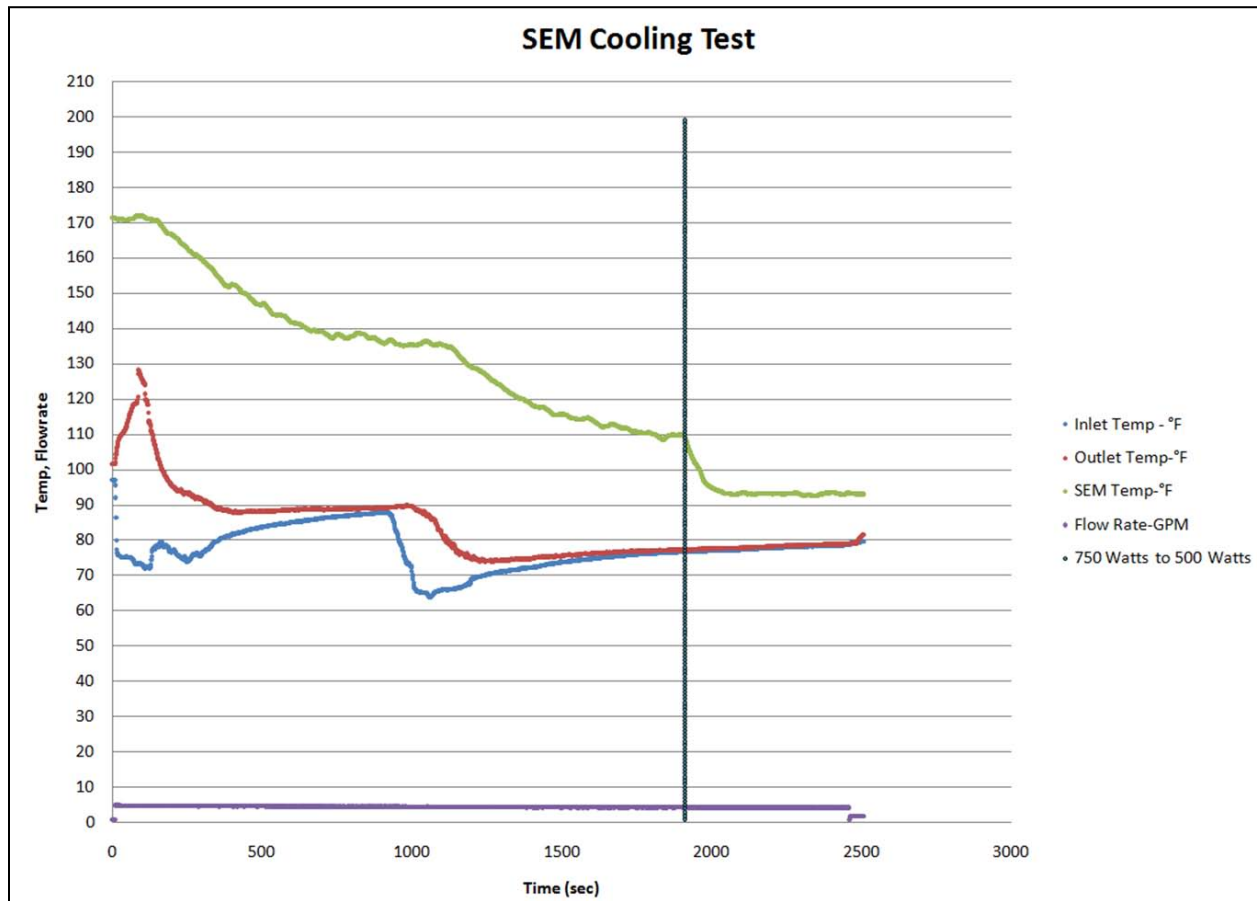
To simulate this output inside the ABCO Subsea laboratory, testing personnel used an empty stainless steel shell from a SEM in the field. Heat lamps were placed inside the SEM shell, and the SEM shell was placed inside the SEM Cooling System. Thermometers were installed on the inside of the SEM shell and on both the fluid inlet and fluid outlet of the SEM Cooling System.



ABCO Subsea found that when the SEM was emitting 750 Watts of heat, the SEM Cooling System could decrease the temperature of the SEM from 170°F to 109°F over the course of 31 minutes. If the SEM's internal heat output was then decreased to 500 Watts, the SEM Cooling System could further lower the SEM's temperature from 109°F to 93°F in an additional ten minutes.

This represented a total drop of 77°F over the course of 41 minutes.

Wattage	Water Flow Rate	Test Start/End Time	Start Temperature	End Temperature
750	4.25 gal/minute	0-1900 seconds	170°F	109°F
500	4.25 gal/minute	1900-2460 seconds	109°F	93°F



Present Day

The SEM on the rig in the Gulf of Mexico has not overheated during routine above-water maintenance since the installation of ABCO Subsea's first SEM Cooling System. The SEM Cooling System has succeeded in protecting an expensive piece of equipment and improving safety conditions on the rig.

As of May 2013, ABCO Subsea has sold 28 SEM Cooling Systems for use on 13 rigs around the world.

The SEM Cooling System is 48" tall and has a total weight-in-air of 91 lbs. These units can be manufactured, tested and shipped to customers in as little as six to eight weeks.