



By Joel Levitt [JDL@Maintrainer.com](mailto:JDL@Maintrainer.com) Dec 22, 2009

What has six 17,000 HP diesels, can generate 70 MW of electricity; desalinate 500,000 gallons of water day and serves Mojitos by the hot tub? A cruise ship, of course. I spent a very nice week aboard Royal Caribbean's Independence of the Seas, sailing just before Christmas. Chief Engineer Ole Pedersen was

kind enough to take time from his busy day to give me a tour of the engine room. Now they don't do this for everyone. But since I was an ex-merchant mariner and a maintenance guy, and I begged so nicely, he gave me the tour.

Imagine walking into a really clean factory, hundreds of feet long. The six Wartsila turbocharged 12 cylinder diesels spin at 514 RPM to generate 17,000 HP each. The ship gets a little over 1000 gallons per mile, including free hot water and desalinization. Of course the ship could use a diet, weighing in at 160.000 tons. That is about 45 tons per guest aboard.

One difference since my sea duty days was the complete absence of the propeller shaft. Modern ships use powerful 11,000 volt motors attached right to the propellers. The Independence of the Seas is powered by three ABB electric propulsion units: two of them hang in a pod below the bottom of the ship and can rotate 360 degrees, and a third one is fixed. The ship can haul out at 24 knots. In addition there are 4 bow thrusters for maneuvering. What all this means is that, leaving Haiti, we did a U turn in just over the length of the ship. That was impressive.

The ship produces electricity and its own water; hot water is made from waste heat from the engine cooling system. It also had a sewer treatment plant, extensive air conditioning and heating equipment, and plenty of juice for passengers' computers, hairdryers, shaving gear, etc. The kitchen's 162 chefs can turn out 16,500 meals a day. The 61 person maintenance department took care of all this plus the kitchen equipment, laundry equipment, telecommunications/Internet/TV equipment, hospital, and the ship's communications equipment. Oh yes, it measures 1100' from bow to stern and 128' abeam.

The control room looked something like the Star Trek Bridge. Every function of the ship could be called up on the flat panel displays circling the room. Imagine being able to see the temperature of each engine bearing, turbocharger, and the electrical output from each generator. They could even tell if a balcony door was open since it deactivates the room AC unit. The control room operators had a 4 hour watch and an 8 hour maintenance shift each day. They spend quite a bit of time doing TLC maintenance (Tighten, Lubricate, and Clean).

At sea, breakdowns that are noticed by the guests are rare due to the high level of maintenance and built-in redundancy. The ship can run on the electricity generated by only 4 engines – this was normal

operation. Two engines were on standby when I toured. This seemed true for all the systems. Of course if there is a breakdown, the ship has a well equipped machine shop and complete fabrication capability (and the skills to use both).

With over 5500 guests and crew aboard, a serious problem with the ship could be catastrophic. The Independence has made good maintenance practices (including PM, inspection, testing, Predictive Maintenance, and rigorous logging of all events) into their standard operating procedures. They use a CMMS to manage work orders and schedule PMs regularly. They keep their equipment clean, tight and lubricated appropriately. Still, Ole reminded me, "The system is only as good as the information going into it." I couldn't have put it better myself.

Hope you had a great holiday season.