

FRESH WATER, WASTE WATER AND EFFLUENT

Fresh water on a ship is a precious commodity, and we go to great efforts in ensuring it's used most efficiently. Onboard, fresh water is used for drinking, showers, sinks, toilets, galleys, pools and spas and is obtained in one of two ways:

1 Producing it onboard through steam desalination or reverse.

a. Steam desalination systems use evaporators that boil seawater under a vacuum and create steam, which is then condensed into fresh water. Although this process requires high levels of energy, whenever possible we use waste heat from diesel engine cooling water and steam from exhaust gas boilers to heat the water to steam.

b. Reverse osmosis systems operate by pumping seawater under very high pressure through a filter (or semi-permeable membrane). The filter allows only the water molecules to pass through, while the salt molecules are rejected and discharged back into the sea. The reverse osmosis systems being installed on our ships today are much more efficient than previous units. Today's systems provide the same amount of water for only about 35% of the electricity consumption of models from only a few years ago. In 2015, we produced ultimately 2% more freshwater onboard.

2 Acquired from local sources (bunkering).

Fresh water is only bunkered in locations where our use of the water resources will not stress the local community from a social, human health or environmental perspective.



U.S. AVERAGE
80-100
GALLONS/DAY



RCL 2016 AVERAGE
53
GALLONS/DAY



RCL 2016 BEST
45
GALLONS/DAY

The average person in the United States uses about 100 gallons of water per day. On our ships, we calculated an approximate average of 53 gallons of water per person per day in 2016, a savings of up to 45% of the fresh water usage per person each day compared to many of our guest's use of water at home.

Additional water-saving initiatives include:

- Installing new ice makers that use 65% less water than previous machines
- Purchasing sink aerators and low-flow showerheads in crew and guest staterooms
- Using water-reduction technology in kitchens and laundry facilities, including reduced-flow dishwashers, sink aerators and low-consumption laundry equipment
- Re-using clean condensate water from ships' air conditioning units in laundry areas

¹United States Geological Survey -Water Science School, January 10 2013, <http://ga.water.usgs.gov/edu/qa-home-percapita.html>

WASTEWATER AND EFFLUENTS

There are three types of waste water found onboard our ships:

WASTEWATER TYPE	DESCRIPTION	HOW ITS TREATED
Bilge Water	A mixture of liquids, primarily fresh water, that is collected in the engine room from machinery spaces and internal drainage systems	Treated with highly effective oily water separators that produce effluent that is at least three times cleaner than what is required by international regulations. The IMO standard for discharging treated bilge water is 15 parts per million. In 2016, RCL ships discharged processed bilge water treated to an average of less than 1.5 parts per million.
Graywater	Water from showers, baths, washbasins, laundry, dishwashers and galleys	Treated with Advanced Wastewater Purification (AWP) systems*.
Blackwater	Water from toilets, urinals and medical facilities	Treated with Advanced Wastewater Purification (AWP) systems*.

*Advanced Wastewater Purification (AWP) systems treat blackwater and graywater before discharging and produce effluent that is cleaner than what is required by most international sewage regulations and what is discharged from most municipalities. AWP systems have been installed onboard 35 ships – covering 83% of available berths – at a cost of more than \$150 million since 1999. Three of these ships do not meet RCL's Above and Beyond Compliance Policy due to various operational and design issues. But, we are making good progress to overcome these issues and are confident that all AWP ships will be sustainably meeting the RCL discharge standards in the near future. Meeting these standards reduces our environmental footprint and will potentially allow for operational savings in a growing number of ports around the world.