



# WATER FILTRATION -

Age 15-16



## WATER FILTRATION - LESSON PLAN:

### **Curriculum Area:**

Science – Water purification including osmosis, pure and impure substances

### **Activity:**

Theory lesson with knowledge attained worksheet. Can be used in build up to required practicals involving water purification in syllabus.

### **Learning Objectives:**

Learners will:

- Understand that the RN has talented and highly qualified sailors and marines employed in a wide range of roles at sea and ashore.
- Understand the different ways of making potable water through 2 and 3 step processes.

### **Previous Skills:**

Learners will need to be able to work effectively in small groups, sharing ideas and tasks within the activity. Learners will need previous experience of the process of osmosis.

### **Resources:**

- Water Filtration – Age 15-16 PowerPoint
- Worksheet – Water Filter Procedure and results record

### **Introduction/Background:**

Atlantic Challenge introduction, explaining the undertaking by the crew and the reasons for it (raising money and awareness for mental health and family charities who support submariners and their families). The PowerPoint will introduce the crew members and talk about their roles onboard the submarine allowing links to scientific and engineering careers if desired (Benchmarking opportunities). All 4 crew members are engineers with their various roles covering nuclear reactors, propulsion and engines, water systems, weapons and electrical systems. The lesson will put emphasis on the importance of teamwork, communication, leadership and other keys employability skills using the Atlantic Challenge as a backdrop.

Although Earth is covered with water (over 70% of Earth's surface), only about 3% of the water on our planet is not salt water. Of this tiny amount of freshwater, much is locked up in ice and glaciers. Of the remainder, less and less is available to humans because of rising populations and increased pollution. Everyone on Earth must share the same water continuously cycling through, and we are all connected by watersheds. Almost everyone in the Western World is used to having clean water anytime, at the turn of a tap. Most of the world's people are not so lucky and must obtain water from a variety of sources. Many of these water sources contain pollution of some form, whether it is bacteria and microorganisms, chemicals, toxins, waste, litter, or other substances and materials.



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When a Royal Navy submarine deploys for up to 9 months, freshwater availability is a vital factor in the vessel's ability to remain on task anywhere in the world. State of the art submarines have in-built filtration systems to turn the surrounding saltwater in to fresh water for human consumption. Just like when they are onboard their submarine, the rowers on the HMS Oardacious Atlantic Rowing Challenge will be surrounded by water but will not be able to drink it.

With space at a premium on the vessel and each team member expected to drink approximately 6 litres of water a day to maintain their high energy output, a solution to create their own drinking water had to be found.

## **Different types of water purification:**

Distillation – Submarine example

Reverse Osmosis – Oardacious and Surface Ships

The process used by the HMS Oardacious crew is called Reverse Osmosis, in this process sea water is forced through a series of semi permeable membranes which will remove the salt and other impurities from the water. This water is then sterilised using chlorine tablets.

Filtration – Ground water example

Sterilisation – Humanitarian example

## **Review of the Science:**

In the UK, water resources include lakes, rivers, aquifers and reservoirs.

An aquifer is an underground layer of permeable rock, gravel or sand that is soaked with water, while a reservoir is usually an artificial lake, made by building a dam to accumulate and save river water in the valley behind.

## **Filtering the water:**

Solids in the water, such as leaves and soil, must be removed. The water is sprayed onto specially-prepared layers of sand and gravel called filter beds.

Different-sized insoluble solids are removed as the water trickles through the filter beds. These are cleaned every so often by pumping clean water backwards through the filter.

The water is then passed into a sedimentation tank. Aluminium sulphate is added to clump tiny particles together to make larger particles, which settle out more easily. The water is then passed through a fine filter, such as carbon granules, to remove very small particles. The water is then sterilised with either exposure to Ozone gas or UV light.

## **Challenge:**

Attained knowledge worksheet. Multiple choice, short and long answers based on the various types of water filtration with an extension question designed to consider wider context of the Atlantic Challenge utilising problem identification and solving skills.

**Conclusion:** Can you explain the various processes of creating potable water?



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Identify key vocabulary surrounding water filtration.

Give examples situations where each process is either employed or would be a suitable solution.

## **Extension Activities:**

- **Research water filtration types used in your local area.**