

## Pressure in fluids

Off-shore wind farms are used to generate electricity. Underwater cables connect the wind turbines to the national grid back on land. These cables are laid in trenches on the sea floor. The trenches help to protect the cables from being damaged.

SMD, based at Wallsend in Newcastle, designs and manufactures underwater vehicles and equipment which dig the trenches for the cables.

The vehicles have to withstand the pressure of the water above them. They can go as deep as 3000 m below sea level.



*Underwater cable-laying tractor built by SMD.*

### Know

1. Gases and liquids are both fluids. Name two properties of fluids.
2. Describe how the pressure of a liquid changes as the depth increases.
3. Write down the equation used to calculate pressure of a liquid on a surface.

### Apply

4. The top of an underwater tractor is 3.8 m long and 3.2 m wide. It is lowered into the sea until it is 1m below the surface. The force due to the water above the tractor at this depth is 120 000 N.  
Calculate the pressure of the water on the top of the tractor.
5. The tractor now travels 75 m to the North Sea floor. The pressure of the water at this depth is 855 000 Pa.  
Calculate the force on the top of the tractor due to the water.
6. On the sea floor the tractor uses water jets to dig a trench by blasting the sand away. The water jet has a pressure of 700 000 Pa. The water from the jet covers an area of 0.25 m<sup>2</sup>.  
Calculate the force of the water on this area of the sea floor.

### Extend

7. SMD also make a larger tractor which is 7.8 m long and 7.8 m wide. At 75 m below sea level the force on the top of this tractor due to the water is 52 000 000 N.
  - (a) Calculate the pressure of the water on the tractor.
  - (b) Compare this value for pressure with the value of pressure in Q5 and explain your answer.

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