

Fluids

III. Pressure With Depth In A Static Fluid

We know that the pressure applied by water against the hull of a submarine at great depths is very large and can even crush the submarine if the submarine welds have the slightest flaw. This is because of the weight of the fluid pushing down on the submarine and is true for any static fluid.

The pressure at a depth of h in a static fluid can be found by the following relationship:



We will use Newton's 2nd Law to derive this important result both as an example of how static fluids are just an extension of the past work this semester and because it leads to Pascal's principle.

Proof: A fluid of density ρ is shaded in the figure below. We now consider the free body diagram for a cylindrical section of fluid that has a cross sectional area A and thickness h .

