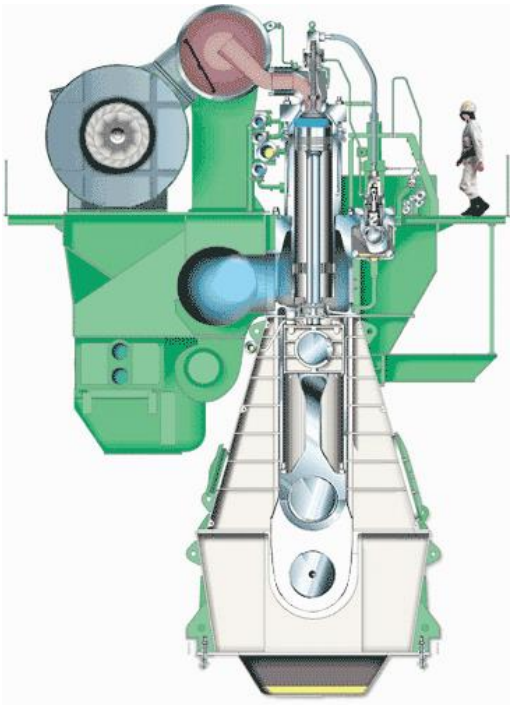
2-Stroke Diesel Engine Operating Principle

The animation on the right from Makita's home page (source) shows how a 2-stroke slow-speed marine diesel engine works. As you can see, the turbocharger is connected to the exhaust manifold that contains exhaust gas (red). The turbocharger charges the scavenging air manifold and scavenging air space with pressurized fresh air (blue) for combustion.



This fresh air enters the cylinder through the scavenging ports when they are uncovered, i.e., when the piston is below these ports. The photo on the right shows scavenging air ports located near the bottom end of a cylinder liner.



Now let us check how the cam opens the exhaust valve. The cam lobe pushes up the hydraulic pump, and the hydraulic pressure thus produced pushes down the exhaust valve to open it. The valve opens slightly before the scavenging ports are uncovered and slightly after these ports are covered. Thus, the moment the ports are uncovered, the fresh air starts removing the combustion products (or, exhaust gas) through the exhaust valve that is now open. This process is known as uniflow scavenging, as scavenging takes place in the form of one-directional scavenging air flow.

Slightly after the piston passes the scavenging ports as it moves up from BDC, the exhaust valve is closed, and the fresh air is compressed by the rising piston and its temperature becomes higher than the auto-ignition temperature of the fuel. Slightly before TDC, fuel is injected. It is heated by the hot combustion air and ignites. The burning fuel expands and the resultant high pressure pushes down the piston, creating power. As the piston passes the scavenging ports, the fresh air enters the cylinder, starting the scavenging process once again. Thus, only two strokes complete one cycle.

In a 2-stroke engine, fresh air intake, scavenging and compression take place as part of a single upward stroke, and combustion takes place every time the piston reaches TDC. In a 4-stroke engine, on the other hand, only one in every two down-strokes is a power stroke since a separate intake stroke is needed. Note also here that there is no intake valve in a 2-stroke engine, since fresh air is admitted into a cylinder through scavenging air ports.

The following YouTube video titled "2 Stroke Marine Diesel Engine MAN B&W: Operating Principle" (source) is an old video but clearly shows how a 2-stroke marine engine works. At the beginning of the video, you see an

engineer making a round in an engine room, and he is doing what present day engineers should not do. What is this? Find this out!