

WHAT HAPPENED ON THE DEEPWATER HORIZON

On April 20, Deepwater Horizon was two days away from temporarily capping the oil well it had drilled and handing off the pumping of the oil to a production platform or pipeline. But during this disconnection process the rig suffered a blowout, caught fire and sank to the bottom.

Here is what went wrong:

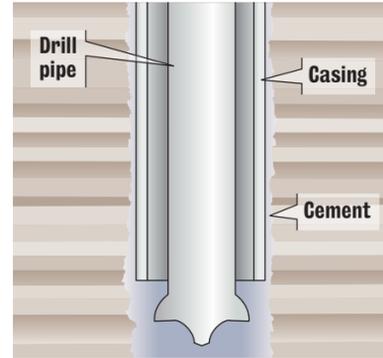
1 THE CEMENT FAILS

Cement is supposed to protect the outside of the well pipe and is used to seal off a well when needed.

PROBLEM:

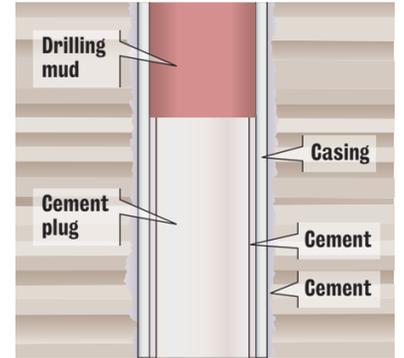
Either the primary or secondary cementing failed, pushing a huge column of natural gas into the well pipe.

THE CEMENTING PROCESS:



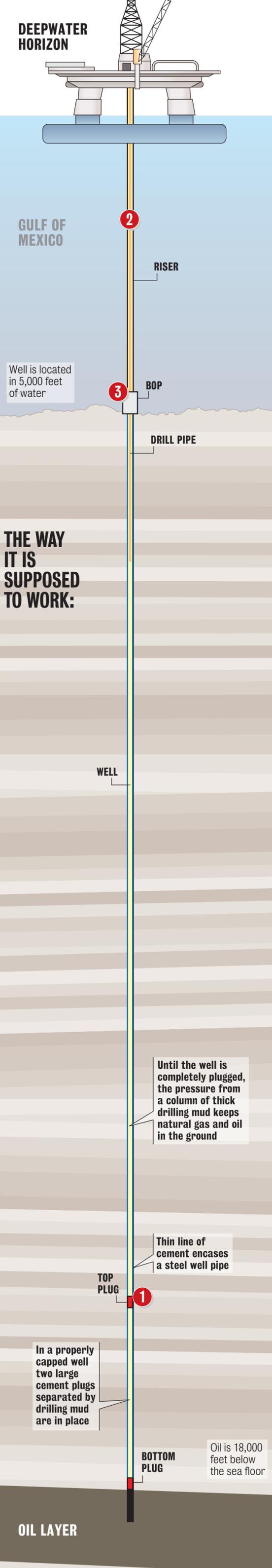
Primary

Cement is pushed between the well casings and the sediment layers that have been drilled through. It protects the metal wall from gas pressure and from gas leaking up the outside of the well pipe.



Secondary

When a well is to be temporarily abandoned, two plugs are cemented in with drilling fluid between them. Sometimes more plugs are used.



2 SEAWATER IN THE RISER

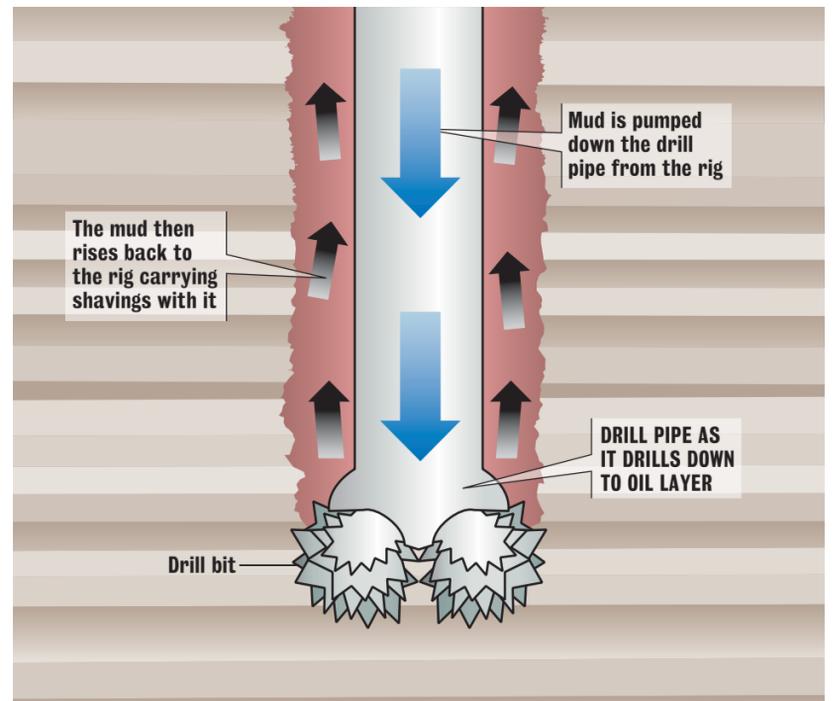
Deepwater Horizon had begun to remove the heavy column of drilling mud that is the primary means of controlling pressure inside a well.

THE USES OF MUD:

- During drilling, mud is pumped down the riser and well to the tip of the drill. The mud then flows back up to rig, taking the drill shavings with it.
- The weight of the mud maintains well pressure so the oil does not rise to the surface.
- The thickness of the mud can be adjusted to deal with a “kick,” a sudden surge of gas pressure.

PROBLEM:

When the cement failed, the natural gas rocketed to the surface, as the weakened mixture of mud and seawater did not have the pressure necessary to hold the gas back. The gas exploded the rig, killing 11 men and destroying the rig.



3 THE BLOWOUT PREVENTER FAILS

The BOP stack is a 450-ton series of valves developed to prevent a gusher if the mud control is overwhelmed.

TWO ANNULAR VALVES:

Closes in and seals on the drill pipe. Or if the drill pipe is not in use, it closes the open hole.

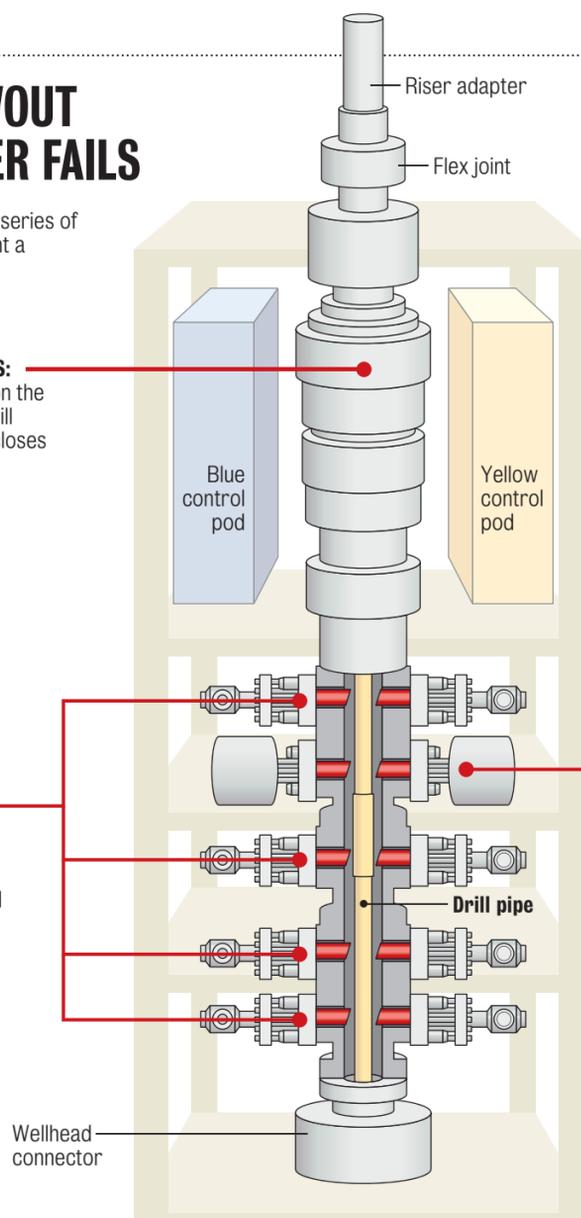
FOUR BLIND RAMS:

Can withstand more pressure than annular valves over open holes. Not used with a drill pipe in place. Two metal blocks close on each other, sealing the well.

PROBLEM:

With only seconds to react, rig operators fired off the shear ram, but it only partially sheared the drill pipe. A joint may have been in the way, or the ram was fouled by pieces of casing or cement from the blowout. For days, remotely operated robots tried to fire off the ram manually, but failed.

SHEAR RAM: The final fail safe, it is designed to close the well by cutting through and sealing the drill pipe. But they are not designed to cut through joints where two drill pipe sections connect.



Note: Man shown for scale. BOP is located on the sea floor 5,000 feet below the surface.