

## Kentucky Oil Wells Plugging

**The program opens with archival film footage of Southern oil wells. Modern day shots of oily surface waters around wells are then screened as the narrator continues.**

**Narrator:** During it's heyday in the 1920's and 30's, the geographic region known as the Illinois Basin yielded more than 4 billion barrels of crude oil, but declining production and low crude oil prices in the years that followed led to the abandonment of many of these wells in southern Illinois, southern Indiana, and western Kentucky.

Since then, "Mother Nature" has reclaimed many of the hillsides and valleys where oil derricks once towered above the trees. A closer look however, reveals that some of these wells weren't decommissioned properly and now pose a threat to the local environment. Because of this threat, EPA region IV and the Environmental Response Team recently assembled a crew at what was known as the Taffy Field in western Kentucky, to evaluate and then plug the wells.

**Greg Powell of EPA's Environmental Response Team and Don Bussey of REAC are introduced and give some more details on the project as more shots of the site are seen.**

**Greg:** Its quite a detailed project, accessing remotely drilled wells that are up to 60-70 years old, and ERT is providing assistance to the region in plugging these wells. The problem with these wells are that they're leaking at land surface and the oil gets into surface waters, which is a action that can be taken under OPA to mitigate the release of oil to surface waters.

**Don:** We're here to make sure that there's no oil that gets to the ground surface and then makes its way into a stream. And there's also been a number of instances here where drinking water wells have been impacted by petroleum moving up boreholes. Petroleum gets in the aquifer, it moves to the water wells, they turn their faucets on, and there's oil in their sink.

**Shots of roads being cleared to the site are shown as the narrator describes the work.**

**Narrator:** After clearing the old access roads that had grown in over the years, the team moved in the two main pieces of

equipment needed to plug the wells: a “work over rig” and a “logging truck”.

The work-over rig, which is placed directly over the well, is a piece of oil well maintenance equipment that can perform various functions, such as hoisting and removing pipe sections.

The logging truck situated a few feet away, houses an array of geophysical monitoring equipment that reads signals from instruments lowered into the well via a 10,000-foot or longer cable spool. These instruments send back info to the cab that can be analyzed by the team to determine the condition of the well and the surrounding geology.

The first set of logs is run on the production tubing, which often needs to be cleaned and cleared of any debris that that might obstruct the instruments from reaching the wells total depth.

**Ray Savage, an EPA contractor from CMC is introduced and details the cleaning operation as we see shots of the cleaning.**

**Ray:** These wells of course have been abandoned for several years, and iron sulfide, paraffin, builds up on the inside of the tubing. We sometimes have difficulty getting tools or bond log tools

inside this tubing, and we use an open end bit that we wash water down through, to try to clean out the tubing in order to get the bond log tool down through the tubing. And this entails, sometimes a twisting of the pipe to work it down the well as we go with the water, flushing everything out that we can.

**Narrator:** Once the production tubing was finally opened up, the team could then assess the various pieces of tubing and casing in the well.

**Animation of a “typical” well is shown as the narrator describes its makeup.**

**Narrator:** On a typical well from the era, a borehole was usually supported by a well casing at least 4 1/2 inches in diameter. Inside the well casing was the production tubing, usually two inches in diameter, which delivered petroleum product to the surface.

**Narrator:** Near the bottom of the well, which was anywhere from 500 to 600 feet deep, the backside of the casing was cemented against the borehole wall. The backside surface of the production tubing sometimes was also cemented to the inside surface of the casing.

Between the backside of the production tubing and the inside casing wall, a mechanical, or rag “packer” was usually inserted and sometimes cemented in place. The purpose of the packer was to stop the flow of any oil outside the production tubing.

**The animation ends and shots of the team removing tubing from the well are seen.**

**Narrator:** Calling any well “typical” in the Taffy Field is really an overstatement, because conditions usually varied from well to well: sometimes there was no production tubing inside the casing, sometimes even no casing. Some wells had cement barriers and a packer, some didn’t, and in some instances, one inch production tubing was found inserted into 2 inch tubing that had become corroded and was leaking during production.

**More animation of a “collar locator log tool” and “bond log tool” being lowered through a well is shown.**

**Narrator:** To make sense of all this, usually the first logging instrument sent down was a Magnetic Collar locator, which located where sections of production tubing were joined, which helped determine the total depth of the well.

Next, an acoustic Bond Log tool was run to determine if there was cement at any zone between the production tubing and the casing, and/or between the casing and the borehole.

**Shots of the team reviewing printouts of the logs cover the narrator as he continues.**

**Narrator:** After reviewing the results of the logs, the production tubing was removed. In cases where the tubing was cemented in place, a small explosive charge was lowered and detonated at the collar to help break the tubing above the cemented zone.

Then, once all production tubing was removed, another set of logs was run on the well casing.

**Don Busey of REAC returns to describe the next step as shots of the team running logs are shown.**

**Don:** Normally after we've done some clean up on the wells, pulled some tubing and some other things, we'll run a casing collar locator log and a gamma ray log tool down hole, and what those logs provide us are data that we'll be able to use to assess the stratigraphy of the subsurface, in other words, give us information on what type of rock formations we have, as well as giving us information on the casing that might be in the hole.

**Narrator:** The results of the this set of logs, in particular, the logs that assess the stratigraphy, or geology, help the team determine if and where any aquifers need to be protected from migrating oil. The locations of the aquifers dictate where to set a bottom plug and where to perforate the casing.

**Animation of the well is shown again to show how the cement is injected and circulated through the well.**

**Narrator:** The perforations allow cement to be injected into the space between the backside of the casing and the borehole. Cement is pumped through the perforations and allowed to circulate up the backside of the well casing, completely sealing the borehole from any vertical movement of oil. The inside of the casing is also filled with cement from bottom to top, effectively sealing the total depth of the well.

**Ray Savage of CMC and Greg Powell of ERT return to describe the final steps of sealing a well.**

**Ray:** After the cementing process has been done, we'll dig out around the casing and cut the casing off, a minimum of 3 foot below the surface. Sometimes the cement will settle back into the formation and we have to top the wells off after we've cut the casing off.

**Greg:** Region 4 is planning to plug approximately 50-60 oil wells that are leaking. The progress is going as well as can be expected. Some of the wells are in creek beds, some of them in swampy areas. So it's generally taking approximately 3 days per well to plug a well that has an average depth of 5-600 feet in the Taffy Field.