A pig is a mechanical device that is pushed through the pipeline by the oil to perform various operations inside the pipeline without stopping the flow of oil. This process is referred to as "pigging." Alyeska runs two basic types or classes of pigs: cleaning and instrumented (smart) pigs. These devices help Alyeska clean and inspect the pipeline and prevent and detect problems.

Types of Pigs

Alyeska employs two types of pigs: cleaning pigs and instrumented (smart) pigs. Cleaning pigs, as the name implies, perform tasks that clean the inside walls of the pipeline. Smart pigs are use to inspect the pipeline for corrosion, metal loss, deformations, and the position of the pipeline.

Cleaning Pig

Instrumented (Smart) Pigs

Instrumented pigs are in-line-inspection (ILI) tools called "smart pigs." The data they gather allows engineers to recommend intervention before anomalous features become a problem. Alyeska has employed ILI tools before they were mandated by regulations, and ILI tools remain a vital component of Alyeska's Integrity Management program. Smart pigs are used to detect and measure corrosion and metal loss internally and externally on the pipe wall. In addition, smart pigs can detect curvatures in the pipeline. The following types of smart pigs have been used to inspect the condition of the trans-Alaska pipeline:

Ultrasonic Transducing (UT): UT uses sound waves to measure the thickness of the steel pipe wall. The pig knows the speed of sound in steel and therefore is able to calculate the thickness.

Magnetic Flux Leakage Detection (MFLD) Pigs: This corrosion measurement function uses powerful magnets to saturate the pipe wall with magnetism. Sensors between the poles of the magnets detect disturbances caused by metal loss due to corrosion or other mechanical damage.

Curvature Detection: This function employs inertial navigation technology to measure the position and shape of the pipe. The device tells the recorder where the pig is in three dimensional space. This tool also has measuring "fingers" arrayed around the pig body to measure the shape of the pipe. This data allows the engineers to monitor dents, ovalities and wrinkles in the pipe. Engineers also determine where the pipe is moving due to settlement or upheaval.

Cleaning Pigs

These pigs sweep the pipe walls to remove built up wax, water, or other solids that precipitate out of the oil stream. They help prevent the buildup of a corrosive environment, and a regular cleaning regiment makes the oil easier to pump.

Instrumented (Smart) Pigs

WHAT IS THE PIGGING PROCESS?

The pigs are inserted into an oversize section of pipe (pig launcher) at Pump Station 1 and Pump Station 4. In addition, a pipe "spool piece" is installed at Pump Station 8 to allow pig launches at this location if necessary. Pigs travel in two segments of the pipeline: 144 miles from Pump Station 1 to Pump Station 4, and 656 miles from Pump Station 4 to Valdez. The pigs travel to the receiving stations — Pump Station 4 or Valdez — and into another section of oversized pipe (pig receiver) where the pig is isolated and removed. Wax, water, or other solid materials are removed at Pump Station 4 or Valdez after a cleaning pig run, and data gathered during smarts pig runs is later downloaded for analysis.

HOW OFTEN IS PIGGING SCHEDULED?

Cleaning pigs are run weekly, and smart pigs are scheduled every three years. Exceptions to these schedules are made if events dictate otherwise. Timely detection allows Alyeska to address areas of concern and potential problems before they become real issues. Alyeska's pigging schedule meets and, in some instances, surpasses regulatory requirements. The US Department of Transportation requires smart pig runs every five years. In 33 years of operations, more than 60 smart pigs have inspected the trans-Alaska pipeline.

Prudhoe Bay

PS 1 — Pig Launcher
PS 2 (Ramped Down)
PS 3
PS 4 — Pig Launcher/ Receiver
PS 5 (Relief Station)
PS 6 (Ramped Down)
PS 7
PS 8 (Ramped Down) — Back-up Pig Launcher/ Receiver
PS 9
PS 10 (Ramped Down)
PS 12 (Ramped Down)
Marine Terminal — Pig Receiver

Where do pigs travel?

The pigs are inserted into an oversize section of pipe (pig launcher) at PS 1 and PS 4.

The pig travels in two segments:

- 144 miles from PS 1 to PS 4

- 656 miles from PS 4 to the Marine Terminal in Valdez

Back-up launcher/receiver at PS 8

PS = Pump Station