Episode Book

EPISODE #5889

How Pipeline Pigs Actually Work

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SYNOPSIS

Pipeline "pigs" started as straw bundles shoved down lines to sweep them clean — the squealing noise gave them the name. Today's instrumented pigs weigh several tons, carry magnetic and ultrasonic sensors, and find corrosion and cracks in pipe walls buried four feet underground. This episode walks through the whole picture: cleaning pigs versus smart pigs, magnetic flux leakage versus ultrasonic testing, why tight axial cracks defeat standard tools, how inertial navigation tells you which kilometre of buried pipe holds the defect, and what happens when one stops moving. Plus the uncomfortable question: how much of the world's pipeline is actually inspected on any real schedule, and why nobody can give you one honest number.

TRANSCRIPT



Corn

A hundred and twelve kilometres of pipe, a four-inch line, and they pushed more than eleven hundred cubic metres of water through it trying to get two pigs back.



Herman

Which is roughly twenty percent more than the line actually holds.



Corn

So Daniel wants to know how pigging works.



Herman

Right, and it starts with a name that is much funnier than it should be, because "pig" is not an acronym.



Corn

It is now. Pipeline Inspection Gauge. But that came later, as a backronym.



Herman

The original pig was a bundle of straw wrapped in wire or leather, shoved down a line to sweep it out. The squealing noise it made going through the pipe gave it the name.



Corn

Which tells you everything about how much dignity the industry had in its early days. None.



Herman

And now the same word describes a machine that weighs several tons and carries enough electronics to find a crack you cannot see with your eye, buried four feet underground, in a pipe that runs for a thousand kilometres.



Corn

So Daniel wants the whole thing. The distinction between the dumb cleaning pig and the instrumented smart pig, how they move, how they find corrosion and cracks and thinning walls, how you know where the defect is when the tool came out of the ground two hundred kilometres from where it went in.



Herman

And what happens when one of them stops.



Corn

Especially that. He also asks about the Trans-Alaska Pipeline System by name, whether some pipelines are simply impossible to inspect internally, and how much of the world's pipeline is actually checked this way on any kind of schedule.



Herman

The answer to that last one is where it gets uncomfortable, because the honest answer is nobody can give you a single number, and the credible numbers disagree by so much that one of them makes the other look like a rounding error.



Corn

Start with the two classes of machine, then.



Herman

Cleaning pigs and smart pigs, and the split is real. A cleaning pig sweeps the internal wall of the pipe. It pushes wax off the wall, it pushes water out ahead of it, it pushes loose solids. On the Trans-Alaska line they run those weekly.



Corn

Weekly.



Herman

Weekly. That is not inspection, that is housekeeping. A pipe carrying crude at low velocity will precipitate emulsified water out of the stream, and that water sits on the bottom of the pipe and supports microbial corrosion. The cleaning pig is what keeps that from accumulating into a problem.



Corn

And the smart pig is the one with the sensors.



Herman

Instrumented in-line inspection tools. They combine signal sources, sensors, onboard computers, power. The big-diameter ones can easily exceed several tons. This is a machine you crane into a launcher.



Corn

Several tons, travelling at whatever speed the oil happens to be moving.



Herman

And that is the thing to hold on to. The pig is not driven. It has no motor. It has no steering. It is pushed through the pipeline by the product itself, by the differential pressure across its sealing discs.



Corn

So it is a passenger.



Herman

It is a very well-instrumented passenger. The flow is not stopped to run it. You launch it into a live line and the oil carries it. And when pumping is not an option, the alternatives are tethering it on a cable or putting something self-propelled in there, which is the entire robotics frontier we will get to.



Corn

So the pig goes where the pipe goes.



Herman

The pig goes where the pipe goes, and this is where the academic literature is refreshingly blunt. A 2017 review in Robotics described pigs as uncontrollable and unable to adapt to sharp changes in pipe direction and diameter. That sentence explains why the field is as messy as it is.



Corn

Uncontrollable is a strong word for a several-ton machine inside a pipe.



Herman

It means what it says. Once it is in, the operator has no authority over it. Everything about the pig has to be decided before it goes in. The bend radiuses it can negotiate, the diameter changes it can survive, the sensor configuration it carries. And the answer to all of it comes from the pipeline as built, not from the pig once it is moving.



Corn

What actually defeats one?



Herman

The list is short and it is all plumbing. Plug valves, because the plug splits the cross-section and there is no clean bore for the pig to pass. Diameter changes. Vertical sections, where the pig has to be pushed up a column of liquid and gravity is against it.



Herman (continued)

Tight-radius elbows. T-sections, where the flow can carry it off into a branch line it was never meant to enter.



Corn

The elbow one is interesting because it is a number, not a category.



Herman

It is. There is an industry-typical minimum bend radius of about three diameters, three D. A bend tighter than that, say a one-and-a-half D elbow, is below what most caliper tools and most magnetic flux leakage tools can physically negotiate. And that is a very common cause of a stuck pig. It is not a dramatic failure. It is somebody's drawing from thirty years ago.



Corn

A pipe that was built before anyone intended to inspect it.



Herman

Which is the whole problem in one sentence. Now, how the smart pig actually sees defects. There are a handful of modalities and each of them is blind to something the others catch.



Corn

Start with the magnetic one, because it is the oldest and the name is good.



Herman

Magnetic flux leakage. MFL. The tool carries powerful magnets that saturate the pipe wall with magnetism. If the steel is continuous, the flux runs through it. Where metal is missing, the flux leaks out of the wall, and sensors sitting between the poles of the magnet detect that leakage.



Corn

So it finds holes by finding where the magnetism escapes.



Herman

It finds the disruption in the field. Its great advantage is that it works in both liquid and gas lines, because it needs no contact medium. It is magnetic, the wall is steel, and that is the entire requirement.



Corn

Does it tell you how deep the pit is?



Herman

It tells you the anomaly is there and it estimates severity. The accuracy of that estimate is the thing everybody argues about, and it is why a run is never the last word.



Corn

Then the ultrasonic one.



Herman

High-frequency sound waves, fired radially into the wall. The tool knows the speed of sound in steel, so it times the return and calculates wall thickness. The catch is couplant: ultrasound does not travel through air well, so UT historically required liquid in the line. In an oil line that is free. In a gas transmission line it is a problem, and that problem is what EMAT was invented to solve.



Corn

Electromagnetic acoustic transducer.



Herman

EMAT generates the ultrasonic wave electronically inside the pipe wall rather than transmitting it through a liquid. No couplant needed. That brings ultrasonic measurement to gas transmission lines. As of the mid-2000s it was still in the early stages of field application, so this is a relatively recent capability compared to MFL.



Corn

And cracks are a different animal from corrosion.



Herman

Completely different, and this is where the tool set thins out. Conventional MFL is good at metal loss. It is not good at a tight crack, because a tight crack is a discontinuity that is almost closed, and the flux has somewhere to go. A crack oriented axially, running along the length of the pipe, is especially hard for the standard tool. So you bring in two more.



Corn

Transverse flux inspection.



Herman

TFI. It realigns the magnetic flux so it runs circumferentially around the pipe rather than along it. A crack running along the pipe is now perpendicular to the field, and it shows up. And then shear-wave ultrasonic, which fires sound into the wall at an angle rather than straight through it.



Corn

Neither the standard magnetic tool nor straight-through ultrasound finds tight cracks reliably.



Herman

Correct, and that is Richard Kuprewicz's point in the Pipeline Safety Trust paper. He calls the all-finding pig the Holy Grail for the vendors, and says plainly that currently there is no pig that can accomplish it. ROSEN says the same thing in different words. No single inspection methodology will detect, size and identify all possible anomalies.



Corn

So the operator runs several tools at different times and overlays the results.



Herman

Which is expensive, slow, and the only honest option available. There is also the caliper pig, which is almost the opposite problem. It is not looking for metal loss at all. It carries an array of measuring fingers around its body, and those fingers feel dents, ovalities, wrinkles, any place where the pipe has deformed out of round.



Corn

Fingers. Actual mechanical fingers dragging along the inside of a pipe at speed.



Herman

At whatever speed the flow gives them, yes. And this is where the location question comes in, which is the part of Daniel's prompt I find most interesting, because "the pig found a crack" is worthless information.



Corn

It is worthless unless you know which of six hundred kilometres of buried pipe it is under.



Herman

The answer is inertial navigation, and it is the same trick a submarine or a missile uses. The mapping and geo-positioning pig carries accelerometers and gyroscopes. It starts from a known point at the launcher, it integrates its own motion, and it builds a profile of the pipeline's position in three dimensions as it travels.



Corn

So it is not measuring the pipe. It is measuring itself.



Herman

It is dead reckoning through a steel tube. And it works well enough that the curvature pigs on the Trans-Alaska line can tell the recorder where they are in three-dimensional space, and the Geopig data from that line has been processed into detailed displacement and bending-strain profiles.



Corn

Bending strain.



Herman

The pipe is not a rigid object. It settles. It moves with the ground. A pipeline in permafrost or in soft soil can shift over years, and the mapping pig sees that as a change in curvature. So the same run that tells you where the pipe is also tells you where it has moved since the last run.



Corn

That is a lot of information from a device that has no idea where it is.



Herman

It has a very good idea where it is, and increasingly it is corrected by GPS at the points where it can be, though a buried line by definition blocks the signal most of the way.



Corn

Kuprewicz has a warning about this, doesn't he?



Herman

He does. Mapping pigs produce positional data, and that data should never be used to override the requirement for critical field locates when someone is about to dig. The pig tells you roughly where the pipe is. It does not tell you precisely enough to put a backhoe through the ground next to it. You still have to locate the line.



Corn

Which is a nice humility note to carry into the operational half of this.



Herman

It is the right place to pause. That is how a pig sees and that is how it knows where it is. What that looks like at scale on an eight-hundred-mile line, and what happens when one of them stops moving, is a different conversation.



Corn

Eight hundred miles. Prudhoe Bay to Valdez.



Herman

And roughly half of it above ground, roughly half buried. About four hundred and twenty miles above, about three hundred and eighty in the ground. Which matters, because the buried half is where all the location difficulty lives.



Corn

What is the actual cadence on that line?



Herman

Cleaning pigs weekly. Smart pigs every three years. The US Department of Transportation requires a smart pig run every five years, so Alyeska is running ahead of the requirement by a comfortable margin.



Corn

And they have been doing this how long?



Herman

In the first thirty-three years of operation, more than sixty smart pigs had inspected that line. Alyeska's own engineering advisor described them as one of the more aggressive users of in-line inspection tools from day one.



Corn

That is not the picture people have of a pipeline operator.



Herman

The history backs it up. They developed a forty-eight-inch magnetic flux corrosion pig and tested it over almost three years before putting it into service. That is a serious capital commitment to a tool that did not exist yet.



Corn

Why the emphasis on corrosion specifically?



Herman

Because in 1988 ultrasonic inspection found internal corrosion on that line, concentrated in the low-velocity piping where emulsified water was settling out, and the diagnosis was microbial. Bacteria living in the water layer, eating the steel. That finding is what led to the chemical inhibitor program.



Corn

A pig found the problem, and the fix was chemistry.



Herman

And by 2003, with corrosion concerns in the news, Alyeska had completed a round of smart pig runs ahead of schedule, though the analysis of that data was still outstanding at the time. That is worth noting. Running the tool and understanding the data are two separate projects.



Corn

How is the line actually segmented for this?



Herman

Pigs launch at Pump Station One and Pump Station Four, with a backup spool at Station Eight. From One to Four is a hundred and forty-four miles. From Four to Valdez is six hundred and fifty-six miles.



Corn

Six hundred and fifty-six miles in one run.



Herman

In one run, for the sections where that is the plan. Most smart pig runs in the industry happen on shorter segments between pump or compressor stations, because a shorter run is easier to plan, easier to recover if something goes wrong, and the data is more manageable. But the capability to run most of the line exists.



Corn

Alright. What happens when one stops.



Herman

Two ways to stop, and they are quite different. The first is that the pig loses its seal. The sealing discs wear, or they tear, or the line is abrasive, or the pig is running through a dual-diameter section where the discs cannot keep contact. Once the seal is gone, the product flows past the pig instead of pushing it, and the pig simply sits there while the oil



Herman (continued)

goes around it.



Corn

It becomes a wall ornament.



Herman

Inside a pipe, yes. The second failure is an obstruction. Debris has built up ahead of it, or a valve is not fully open, or there are hydrates, or a broken pig bar from a previous run, or a kink, or a fitting with a smaller internal diameter than the drawings say.



Corn

So either it stops pushing or something stops it.



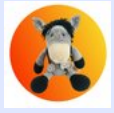
Herman

And the recovery playbook has some improvisation in it. You can increase the pigging volume and pressure, push harder behind it. You can depressurise the line and wait, because the pig's material has memory, and if it has been deformed squeezing through something, it may recover its shape in a quarter of an hour. You can run a line-size foam swab behind it to re-establish a seal and let the flow do the work.



Corn

And reverse the flow.



Herman

That works only if the pig is bidirectional. A standard cup pig is unidirectional, so reversing the flow will not bring it back. It will just press it harder against whatever is holding it.



Corn

Then you send another pig after it.



Herman

Which is common and carries real risk, because the rescue pig can stick too. And then you have two pigs in the line instead of one. If you are going to do it, the rescue pig should carry magnets and a transmitter so you can at least find it from the surface.



Corn

The South Pars one is the story, though.



Herman

It is the best-documented recovery I have seen. A hundred-and-twelve-kilometre line, four-inch diameter, offshore, in the South Pars gas field. They were running a flooding, cleaning and gauging operation, and by two days into it no pigs had come out the other end.



Corn

How much water had they put in by then?



Herman

More than eleven hundred cubic metres of treated fresh water, which is about twenty percent more than the line's own volume. The line was full and then some, and nothing had arrived.



Corn

That is not a blockage. That is a pig that has stopped moving entirely.



Herman

And the root cause when they got it out was accumulated debris rather than a sudden obstruction. The tell was in the discs. They were asymmetrically eroded rather than torn, which pointed to sustained contact with something over distance rather than a single hard impact.



Corn

So the line was progressively fouling and the pig was grinding through it.



Herman

And losing seal as it went. The rescue was a special pump truck that lifted the flowrate to forty cubic metres an hour, which is a pig velocity of about one point four metres per second, and raised the pressure to two hundred and thirty bar. The second and third pigs came back after they had injected another three hundred and forty and then eight hundred and seventy cubic metres of water.



Corn

Two hundred and thirty bar in a four-inch line.



Herman

The pipe held. That is the part of the story that does not get enough attention. The recovery was a pressure test whether they wanted one or not.



Corn

There is a smaller one from TDW, isn't there, where the pig stopped almost immediately?



Herman

Twenty-eight-inch bidirectional cleaning pig, stalled in a production tee about thirteen and a half metres into the line. It had barely started. And it made the line unpiggable, because now there was a pig sitting in it, and it was blocking a valve replacement project. They ended up designing a special recovery tool to reach in and pull it back to the



Herman (continued)

launcher.



Corn

Thirteen metres. That is the length of a garden.



Herman

And it took an engineered tool to get it out. Which is the general lesson. Distance does not determine difficulty. A pig stuck thirteen metres in is as much of a problem as one stuck at kilometre ninety.



Corn

Now the question that runs under all of this. Are there pipelines that simply cannot be inspected internally?



Herman

Yes, and this is where the sources disagree, and I want to lay the disagreement out rather than smooth it over. The 2017 Robotics review estimates that half a percent of pipe networks are inaccessible to conventional pigging. Half a percent.



Corn

Which implies the other ninety-nine and a half is piggable.



Herman

That is what it implies. And that half percent is about twelve and a half thousand kilometres worldwide, but they make the point that those are disproportionately the most valuable pipes, the above-ground installations that are hardest to get a tool into.



Corn

And ROSEN says something different.



Herman

ROSEN says various numbers are quoted, and depending on the source they range from about half of the globally installed pipelines to much more. They note that roughly forty percent of midstream transmission lines get described as un-piggable.



Corn

Half a percent and forty percent. That is not a disagreement about the same measurement.



Herman

It is not. And ROSEN are admirably direct about why. The term is not precisely defined. A line is called un-piggable for a dozen different reasons, and whether it counts depends entirely on which reason you are using.



Corn

So the industry changed the word.



Herman

ROSEN say the industry now prefers challenging to un-piggable, precisely because many of these lines can still be inspected internally with modified tools. A line with no launcher can get a temporary trap or a hot tap. A line with a tight bend can take a bidirectional tool that is designed for it.



Corn

So un-piggable usually means not piggable by the tool you happen to own.



Herman

Very often, yes. And ROSEN break the difficulty into three axes, which I think is the cleanest way to think about it. Accessibility, which is whether you can get a tool in at all. Negotiability, which is whether the geometry lets it pass, meaning tight bends, diameter changes, wyes, unbarred tees. And propulsion, which is how you move it, whether that is pumping, tethering, or something self-propelled.



Corn

And that last axis is where the robots live.



Herman

That is where the robots live. And there is a first on the Trans-Alaska line that is worth telling properly. Summer of 2014, a robotic crawler inspected about eight hundred and fifty feet of thirty-six-inch buried piping at Pump Station Three.



Corn

Eight hundred and fifty feet, against six hundred and fifty-six miles.



Herman

It is a rounding error against the line, and it was still a milestone, because it was billed as the world's first crawler pig integrity inspection of a liquid pipeline. The machines had only been used on gas lines before that. This was the first time one went into a liquid line.



Corn

What was the robot?



Herman

About two hundred pounds, Russian-built, from Diakont. And the result of the inspection was that the pipe needed no repairs and there was not much corrosion. The tool was used at four more pump stations the following year and scheduled for two more after that.



Corn

So the technology worked. What was the resistance?



Herman

The resistance was cultural and it is captured in one quote from Alyeska's senior director of risk and compliance. He said the Trans-Alaska Pipeline System is not a guinea pig. It is one hundred percent assurance. You did not try new things on TAPS.



Corn

The wording is doing something deliberate there.



Herman

He turned the industry's own nickname into a warning about experimentation. And it is a defensible position for a line carrying a significant fraction of the country's oil supply. The interesting thing is that they eventually did the experiment, and the answer was that the pipe was fine.



Corn

What does the robotics research actually look like?



Herman

The 2017 review looked at two hundred and thirty-four in-pipe robotic systems, covering diameters from ten millimetres up to twelve hundred. Wall-pressing, which is exactly what it sounds like, a robot bracing itself against the pipe wall, is the most common traction method in research systems at forty-four percent. Wheeled locomotion is close behind at forty-three percent. And snake robots, at thirteen percent of research systems, are described as having become the preferred method of commercial pipeline inspection.



Corn

Thirteen percent of research, preferred in commercial. That gap is interesting.



Herman

It says the research community and the field have different opinions about what works. And the constraint that shapes all of it is stated best by ROSEN. The paramount requirement is fail-safe use. What goes into the line must come out.



Corn

Which rules out a lot of elegant designs.



Herman

It rules out anything that cannot collapse small enough to be retrieved, and it creates a awkward tradeoff. Traction too low and the robot sticks. Traction too high and it damages the line it was sent in to protect.



Corn

What is driving the research now?



Herman

A lot of it is water distribution rather than oil and gas, which makes sense because water lines are the least piggable infrastructure there is. There is recent work on in-pipe robots using particle filter navigation, on a minimal-sensing underwater robot that traverses a flooded pipe with just an inertial unit, pressure and sonar, on hierarchical reinforcement learning for autonomous in-pipe navigation, and on self-propelled wheeled robots for urban gas lines.



Corn

"Minimal-sensing" is a polite way of saying it has almost no idea what is around it.



Herman

That is the honest reading. The regulatory pressure behind the funding goes back a while. The Department of Transportation's pipeline safety arm started funding unpiggable-line robotics work in 2001, triggered by the 2002 regulations that required inspection of all transmission pipelines, including ones that could not be inspected by conventional means.



Corn

So the regulator created the problem the engineers had to solve.



Herman

Which is usually how this goes. Now, Daniel's last question, and this is the one I have been holding back, because it is the least satisfying answer in the episode. How much of the world's pipeline is routinely inspected?



Corn

And the answer is that nobody knows.



Herman

Not to a single figure. Global pipeline infrastructure is roughly two and a half million kilometres. High-pressure transmission lines alone are on the order of two million. And against that base, the two credible estimates of what cannot be internally inspected are half a percent and around forty percent.



Corn

Those are the only two numbers we have, and they are almost two orders of magnitude apart.



Herman

And the discrepancy is definitional rather than factual. Neither group is lying. They are counting differently.



Corn

So if you see a percentage quoted with confidence, you should ask what the person means by the word.



Herman

That is the whole lesson of the last ten minutes. The category is fuzzy, so the number is fuzzy, and the only honest thing to say is that the share of the world's pipeline that receives a real internal inspection on any schedule is not something anyone can state with confidence.



Corn

Herman. Half a percent against forty percent. Which one do you actually believe?



Herman

I think the truth is closer to ROSEN's end, and I will tell you why. The half-percent figure appears to be counting lines that are physically inaccessible to any pig of any kind. The forty-percent figure is counting lines that are inaccessible to a conventional pig in a conventional way. Those are different questions, and the second one is the one that matters operationally, because an operator who calls a line un-piggable does not spend money on it.



Corn

So the definition you pick determines whether a pipeline gets inspected.



Herman

The definition determines the budget. That is the uncomfortable part. It is not just an academic distinction.



Corn

Two hundred and thirty bar. That is roughly three thousand three hundred pounds per square inch in a four-inch pipe.



Hilbert

What happens to the launcher.



Hilbert

Nobody ever talks about the launcher. You have a four-inch pipe, you have a pig inside a chamber at the end of it, and the whole design question is how you get the thing in and out without killing anybody. I spent a year and a half on a launcher design for a contract in Bakersfield and we never did get the door seal right.



Herman

A year and a half on a door.



Hilbert

It is a door that holds two hundred and thirty bar. There was a man called Walt Ottinger who made the closure, and he had a rule that he would only ever make three a year. Three. So you ordered in March and you got it in October, and in the meantime the pipeline sat there.



Corn

And the seal.



Hilbert

It wept. Not failed. Wept. A weep on a launcher closure at that pressure is a fine mist you can see in the sunlight and cannot see under a lamp, so we tested at night with a torch held to the side.



Herman

That is actually a standard technique.



Hilbert

It is the only technique. And the inspector would not sign it because the weep rate was inside tolerance but the pattern was asymmetric, and he said asymmetric meant the seating surface had a defect that would propagate. He was right. We cut the seat out and there was a hairline in it about the width of a hair.



Corn

So the door was the project.



Hilbert

The door was the project. We shipped the launcher eleven months late and the client paid the late fee without arguing because they had watched us cut the seat out.



Herman

And nobody writes about the launcher.



Hilbert

Nobody writes about the launcher. They write about the pig, because the pig is the interesting one. The launcher is where a man stands at night with a torch looking for a mist.



Corn

How many are sitting in your shop?



Hilbert

Four. Three of them are the same model.



Herman

Four launchers.



Hilbert

I do not have anywhere to put them and I am not selling the Bakersfield one.



Corn

Alright.



Herman

So the common belief about all of this, and I want to name it because it turns up constantly, is that the smart pig is the inspection. You run the tool, you get a report, you know the condition of the line.



Corn

That is not how it works.



Herman

The tool produces one partial view. MFL sees metal loss and is nearly blind to a tight axial crack. UT measures thickness and needs liquid. EMAT solves the couplant problem and only arrived in the field recently. TFI and shear-wave ultrasound exist specifically because the standard tools cannot see the crack. The caliper pig is not looking for metal loss at all. No single methodology detects, sizes and identifies everything, so the operator runs several tools at different times and overlays the results.



Corn

Accepts that the picture is always incomplete.



Herman

Every survey is a set of partial views, run on a schedule, compared against the last run. That is what integrity management actually is.



Corn

Which is a strange thing to build an entire safety culture around.



Herman

It is the most honest thing in the industry. They know they cannot see everything, so they built a system that expects to look again, from a different angle, on a different tool, at a different time. The alternative is pretending one run was the answer.



Corn

The thing Hilbert said is the one I keep coming back to. Everybody talks about the pig. The pig is the interesting machine. The launcher is where a man holds a torch at night looking for a mist, and gets overruled by an inspector who was right.



Herman

He was right about the hairline. And that is the actual shape of the ecosystem. The instrument gets the attention, the person at the door gets the outcome.



Corn

There is one thing worth flagging for anyone who wants to go further. The history of how speech recognition went from being a frustration to being good enough to transcribe a conversation is one of the episodes that shaped how we think about a technology getting quietly competent. That is the arc here. Pigging spent decades becoming reliable and nobody noticed.



Herman

Nobody noticed, and the definition beneath it is still contested, which means the number for how much of the world's pipeline is actually checked is not something anyone can give you with confidence.



Corn

Two and a half million kilometres of pipe, and the straight answer is a range that spans two orders of magnitude.



Herman

The research side is moving toward commercial deployment, with wall-pressing and wheeled locomotion dominating the two hundred and thirty-four systems that have been catalogued, and the fail-safe rule holding all of it back in a useful way. What goes into the line has to come out.



Corn

It has to come out. Which is why the robot has to be able to fold itself down small enough to be retrieved, and why the ambitious designs keep losing to the boring ones. The crawler that made history on the Trans-Alaska line in 2014 was two hundred pounds doing eight hundred and fifty feet. It worked. And the quote from the operator was that TAPS is not a guinea pig.



Herman

It is not. It is a pipeline that has run more than sixty smart pigs and is still finding things.



Corn

Thank you to our producer, Hilbert Flumingtop, who has four launchers in a workshop and no plans to move them.



Herman

If you enjoyed this one, try episode eleven, How Does Fine Tuning Work Anyway; episode ten, How ASR Went From Frustration To ... Whisper Magic; and episode twenty, Architectural AI. This has been My Weird Prompts.



Corn

If the show is worth your time, a review helps other people find it. Everything lives at my weird prompts dot com, including the feed.



Herman

If you have a subject like this one, send us your own prompt on Telegram at t dot me slash MWP listener bot. We read them all.



Corn

We will be back soon.



Herman

See you tomorrow.

SOURCES

What the research for this episode read before the script was written. Primary sources first.

1. **Alaska DEC / Alyeska, Pigging the Trans-Alaska Pipeline fact sheet [primary]**
   https://dec.alaska.gov/spar-data/ppr/response/sum_fy11/110108301/factsheets/fact_pigging.pdf

2. **PHMSA, Fact Sheet: In-Line Inspections (Smart Pig) [primary]**
   https://primis.phmsa.dot.gov/stakeholder-comms/factsheets/FSSmartPig/

3. **SLB, How It Works: Pipeline Pigging (published 2015-01-02)**
   https://www.slb.com/resource-library/article/valve-insights/how-it-works-pipeline-pigging

4. **Pipeline Safety Trust, Observations on the Application of Smart Pigging on Transmission Pipelines by Richard B. Kuprewicz (2005-09-05)**
   https://pstrust.org/docs/final_pigging_white_paper.pdf

5. **ROSEN Group, Challenging Pipeline Diagnostics Solutions (2021-07-27)**
   https://pipelinepodcastnetwork.com/wp-content/uploads/2021/07/ROSEN-Challenging-Pipeline-Diagnostics-Rev-07272021.pdf

6. **Mills, Jackson & Richardson, Advances in the Inspection of Unpiggable Pipelines, *Robotics* 2017, 6(4), 36 (published 2017-11-29)**
   https://www.mdpi.com/2218-6581/6/4/36

7. **PWSRCAC *Observer*, Robotic inspection tool redefines Trans-Alaska Pipeline innovation (2015-09-16)**
   https://www.pwsrcac.org/observer/robotic-inspection-tool-redefines-trans-alaska-pipeline-innovation/

8. **Pipetech Corporation, How to Remove 'Stuck' Pigs**
   https://www.pipetechcorp.com/resource/how-to-remove-stuck-pigs/

9. **Offshore Magazine, Data analysis underpins successful pig rescue on small-diameter pipeline (2018-03-07)**
   https://www.offshore-mag.com/pipelines/article/16762137/data-analysis-underpins-successful-pig-rescue-on-small-diameter-pipeline

10. **OSTI, Pig performance characteristics in corrosion assessment (Alyeska/TAPS)**
    https://www.osti.gov/biblio/287805

11. **OSTI, Magnetic-flux pig run successful on TAPS**
    https://www.osti.gov/biblio/6774285

12. **Reuters, Alaska oil pipeline completes corrosion tests (2003-03-21)**
    https://www.reuters.com/article/markets/us/alaska-oil-pipeline-completes-corrosion-tests-idUSN21444183/

13. **Petroleum News, 30 STRONG: Corrosion battle began on Day 1 (2007-10-14)**
    https://www.petroleumnews.com/story/2007/10/14/news/30-strong-corrosion-battle-began-on-day-1/12338.html

14. **Oil & Gas Journal, TAPS corrosion-1: Ultrasonic inspection prompts chemical inhibitor program**
    https://www.ogj.com/drilling-production/production-operations/article/17238784/taps-corrosion-1-ultrasonic-inspection-prompts-chemical-inhibitor-program

15. **Hart et al., Pigging Paper (Cold Regions 2002)**
http://www.ssdinc.com/documents/PiggingPaper_ColdRegions2002.pdf

16. **TDW/PPSA, Operational Pigging Programs (2019)**
https://ppsa-online.com/papers/19-Aberdeen/2019-02-TDW-paper.pdf

17. **Jee Ltd, Recovering a stalled pig using gel pigging (2025-05-12)**
https://insights.jee.co.uk/insights/recovering-a-stalled-pig-using-gel-pigging

18. **Industrial Monitor Direct, Resolving Stuck Pipeline Pig in 1.5D Elbow**
https://industrialmonitordirect.com/blogs/knowledgebase/stuck-pipeline-pig-recovery-15d-elbow-failure-analysis

19. **arXiv:2105.05161 (Kazeminasab & Banks, 2021)**
https://arxiv.org/abs/2105.05161v1

20. **arXiv:2602.05265 (Jakkala & O'Kane, 2026-02-05)**
https://arxiv.org/abs/2602.05265v1

21. **arXiv:2107.03685 (Botteghi et al., 2021)**
https://arxiv.org/abs/2107.03685v1

22. **arXiv:2512.17212 (Gao et al., 2025-12)**
https://arxiv.org/abs/2512.17212v2