High-tech pipeline inspection tools 'have limitations'

This pipeline runs through the Hydro One Corridor and immediately through the community of Rosewoood; this concerns Rosewood.

See Rosewood's letter of concern below

Toronto Star (GTA-GT1/7)—Jessica McDiarmid

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A month before a 1940s-era pipeline running through Mayflower, Ark., burst, it was inspected using a high-tech device that traversed its length, checking for defects.

But on March 29, 2013, ExxonMobil's Pegasus pipeline spilled about 5,000 barrels — nearly 800,000 litres — of oil in a residential neighbourhood in the town of 2,300.

As the Mayflower spill shows, the high-tech inspection devices are not perfect.

Enbridge, the company seeking federal approval to reverse and increase the flow of pipeline 9B that runs across the GTA, uses the technology extensively. It has rejected calls for the line to undergo another method of test, arguing that its in-line inspections are more accurate and avoid unnecessary risks.

The company uses the latest technology available and confirms results with thousands of digs — more than any other company — to check whether the data matches the reality in the ground, said Enbridge's chief operating officer for liquid pipelines, Leon Zupan, who puts the tools' accuracy at more than 90 per cent.

"We end up with a very high degree of reliability," said Zupan. "That hasn't always been the case — the older tools, the older technology, weren't as accurate as what we have developed with industry and what we run in our system right now."

Federal regulators in both Canada and the U.S. have noted in-line inspection technology doesn't pick up all defects — and much depends on the people analyzing the data and planning repairs, a process that can take many months.

In the case of Mayflower, the inspection hadn't picked up the flaw that ultimately led to the rupture.

Pipeline operators rely heavily on in-line inspection tools, torpedo-shaped devices that crawl through the pipelines. Different types look for different flaws such as cracks and corrosion. The data they collect is analyzed to plan repairs.

"Despite their sophistication, the detection capabilities of in-line inspection tools have limitations," the U.S. National Transportation Safety Board noted in its report on a 3.3-million-litre 2010 Enbridge spill in Michigan, the largest on U.S. soil.

Enbridge is seeking approval from Canada's National Energy Board to increase the capacity of Line 9B from 240,000 barrels a day to 300,000 barrels and to reverse the flow of the 639-kilometre section of pipeline from westbound to eastbound.

The energy board already approved the reversal of Line 9A, the segment of pipeline that runs from Sarnia to North Westover, Ont.

If the application for Line 9B — from North Westover to Montreal — is approved, the pipeline will carry crude from Western Canada to Quebec's refineries.

By early next year, the federal energy board will decide whether to approve the Line 9B project and what, if any, conditions to impose.

At public hearings before the board's three-member panel, officials with Ontario's Energy Ministry sought a high-pressure water test of the entire Line 9 — from Sarnia to Montreal — as an added fail-safe before even considering approval of Enbridge's plans for the 38-year-old pipeline.

To conduct a hydrostatic test, an operator must take a pipeline out of service and empty it. Then, the pipeline is filled with water until the pressure is raised to higher-than-normal levels and held over time. Operators detect leaks or ruptures by monitoring pressure, volume and density in the pipeline as well as visual searches.

Some hold hydrostatic tests as the best way to test a pipeline's integrity. Critics, however, argue the tests lack the sophisticated abilities of in-line inspection tools to monitor ongoing corrosion or cracking, and the high-pressure water can weaken small defects, increasing the risk of future rupture.

Energy Ministry spokesperson Mark Smith said a hydrostatic test used in conjunction with in-line inspections would afford "the highest level of

protection."

Hydrostatic tests were conducted on Line 9 before it opened in 1976 and again in 1997, when Enbridge reversed its flow from eastbound to west**.**

"We feel that the same level of confirmation should be required and in place for this project as well," Smith wrote in an email.

But Enbridge said that's not necessary.

"Enbridge is not against using hydrostatic tests but only in circumstances where it is technically beneficial and does not have detrimental effects, causing unneeded pipeline damage," the company said in a recent statement.

Enbridge official Zupan said a battery of in-line inspections, akin to "a medical MRI," were done on all of Line 9 this year and last, allowing company engineers to scour the line centimetre by centimetre.

Those inspections revealed hundreds of defects. The company is aiming to complete 500 to 600 "integrity digs" in the next couple of months to investigate further.

"We don't just go look for the worst offenders, we go look at all of the things that could grow," said Zupan. "We analyze these and say anything that could be a problem in the next three to five years, we're going to make sure that we go in and dig those now."

Those areas aren't at risk of leak or rupture, but rather may need to be fixed or "addressed in some way" in the next few years, Enbridge spokesperson Graham White added.

Pipeline consultant Richard Kuprewicz, who authored a highly critical report on the pipeline submitted to the energy board as evidence, argued that "stress corrosion cracks" are prevalent and at risk of rupture should the proposal go ahead — claims Enbridge called "entirely unfounded" and "grossly unfair."

Small cracks are "insidious" and difficult to detect using smart pigs, said Kuprewicz, who has four decades of experience in the field.

And margins of error increase with the human element involved in analyzing and acting on the data collected, said Kuprewicz, whose report was commissioned by a coalition of environmental groups. He points to the Enbridge spill in Michigan, where an in-line inspection in 2005 detected the crack that ultimately ruptured but it was never flagged as a threat.

The U.S. safety board investigation found problems with both the in-line inspection tool the company used and the engineering assessments derived from the data.

“There’s lots that can be unreliable here,” said Kuprewicz. “We would love the crack-detection tools to be reliable … but after so many years, we’re still seeing too many failures from cracks.”

University of Akron engineering professor Homero Castaneda-Lopez, who studies pipeline corrosion, estimated the accuracy of in-line inspection tools to range from 60 per cent to 90 per cent.

In the case of ExxonMobil’s Mayflower spill, according to preliminary results the flaws detected by its in-line inspection were “all found to be benign and not in need of repair,” spokesperson Aaron Stryck wrote in an email. It ruptured from apparent manufacturing defects.

Frank Cheng, a Canada Research Chair in pipeline engineering who studies corrosion and cracking, said smart pigs are very accurate.

“However it does have its limitations,” said Cheng. “No solution is perfect.”

According to Cheng, in-line inspection tools are excellent at detecting corrosion and large cracks. But small cracks — which, if they occur in a “colony,” can still be risky — pose a challenge. And dirt or other buildup in a pipeline can skew results.

Enbridge’s Zupan said the company’s latest technology can detect small cracks, unlike older tools, including the one it had used in Michigan. The technology has advanced hugely in the past five years.

“We can now see extremely small cracks,” he said.