

INTERNAL CORROSION

PHMSA Data and History

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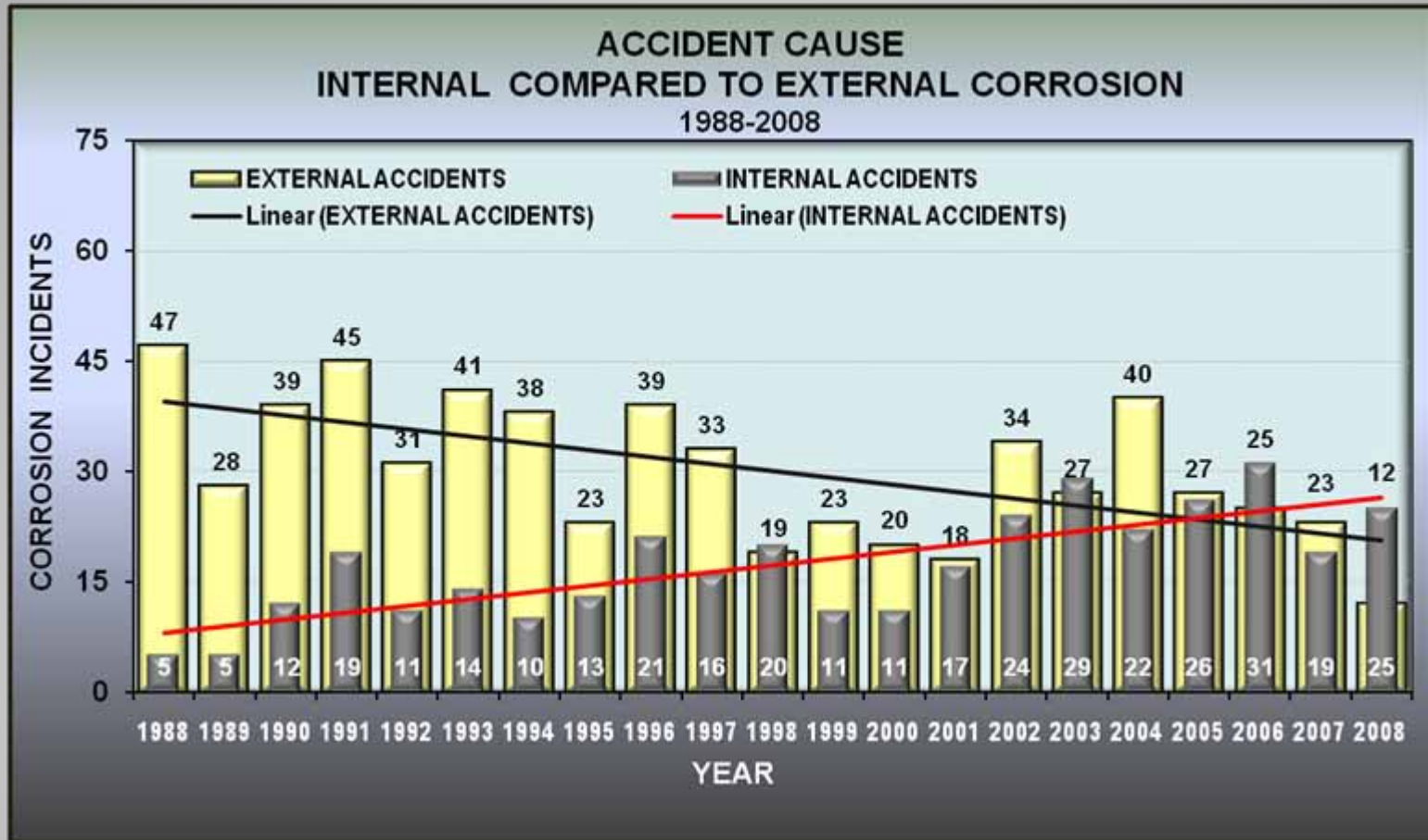
INTERNAL CORROSION VERSUS OTHER THREATS

In many ways internal corrosion should be much easier to deal with than external corrosion, Stress Corrosion Cracking, Third Party Damage, etc..

Most corrosion engineers intuitively know how to deal with internal corrosion



So why is this trend occurring?



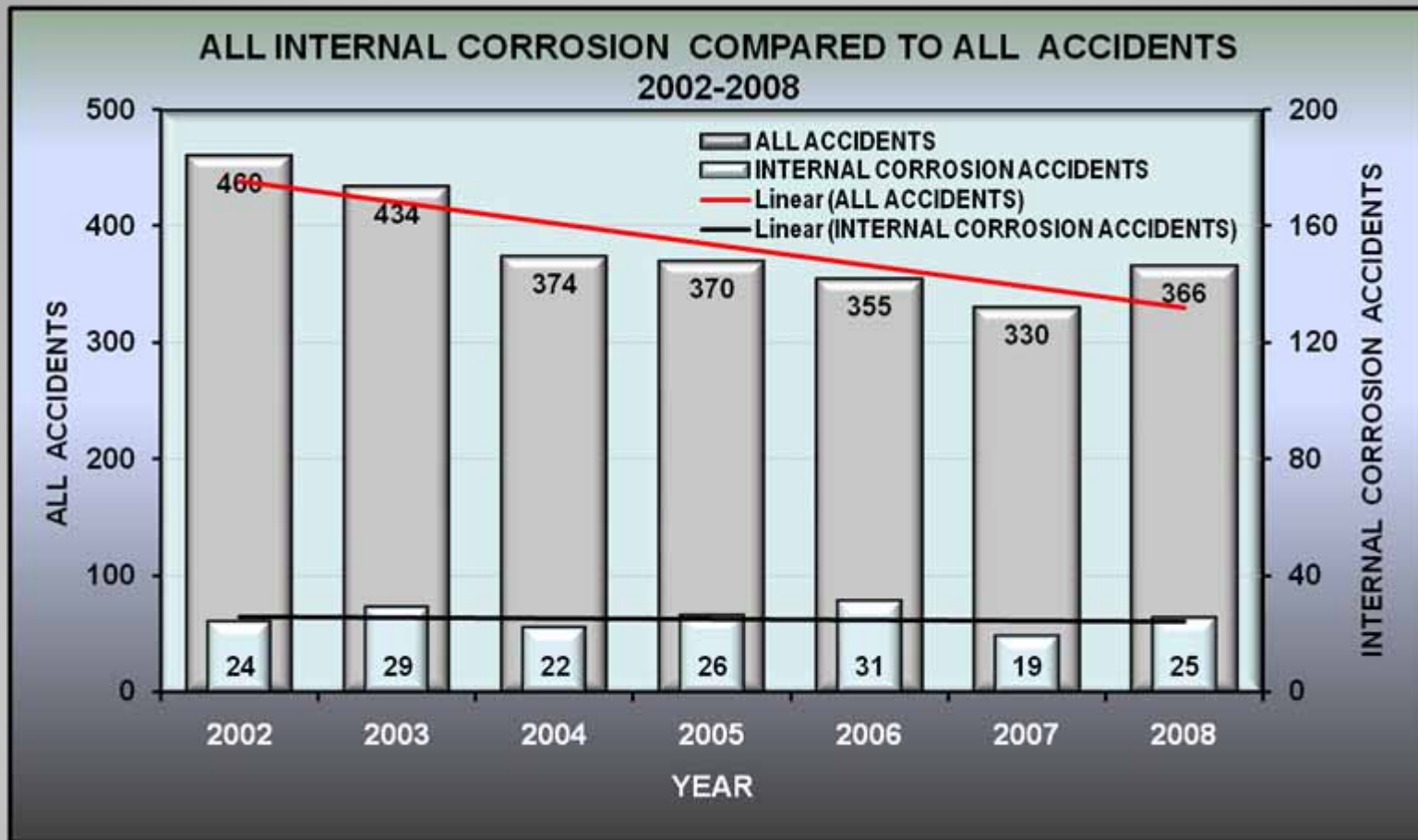
INTERNAL CORROSION – HISTORY

Internal Corrosion has often been thought of as a “secondary level threat” by both pipeline operators and PHMSA.

- External Corrosion and Third Party Damage are often seen as the larger threats
- The exception is when more corrosive fluids are shipped (sour crude, etc...)



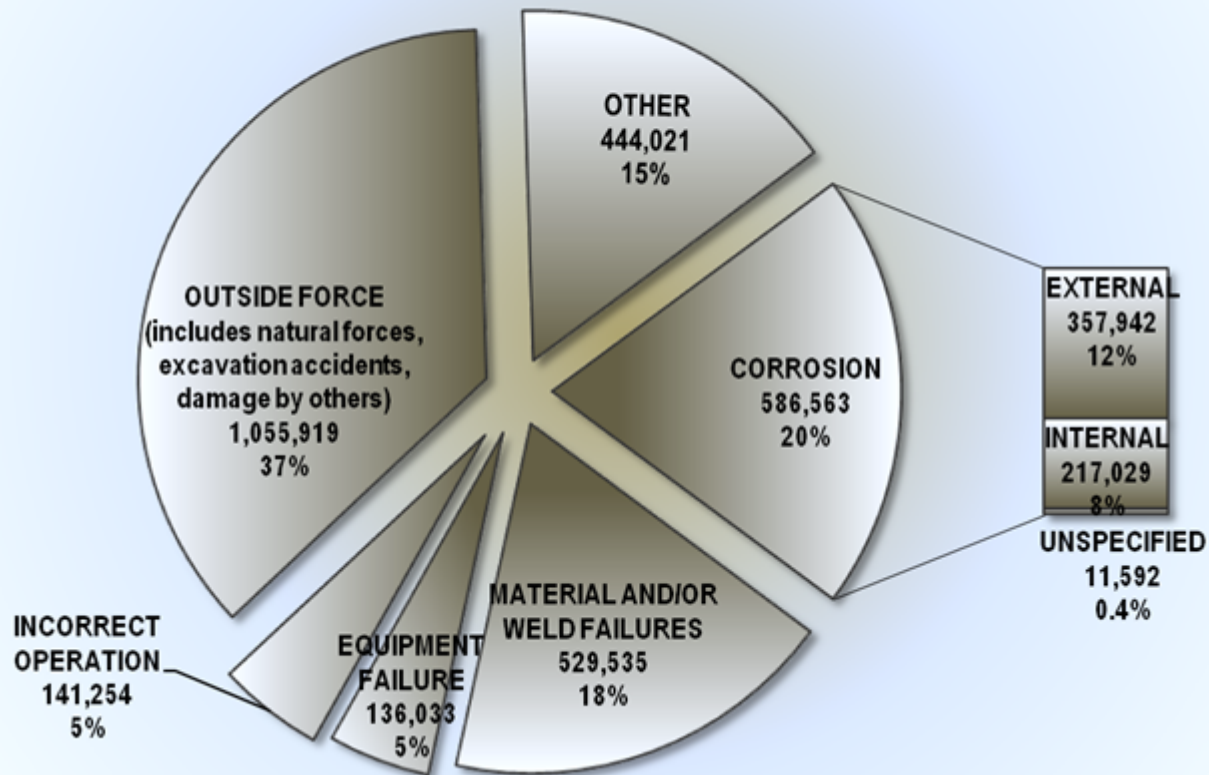
TIME TO ADJUST OUR MUTUAL FOCUS



BARRELS RELEASED

ALL HL ACCIDENTS 1988-2008

BARRELS RELEASED ALL ACCIDENTS
TOTAL SPILL VOLUME: 2,893,325 Bbls 1988-2008



INTERNAL CORROSION – DIFFICULTIES

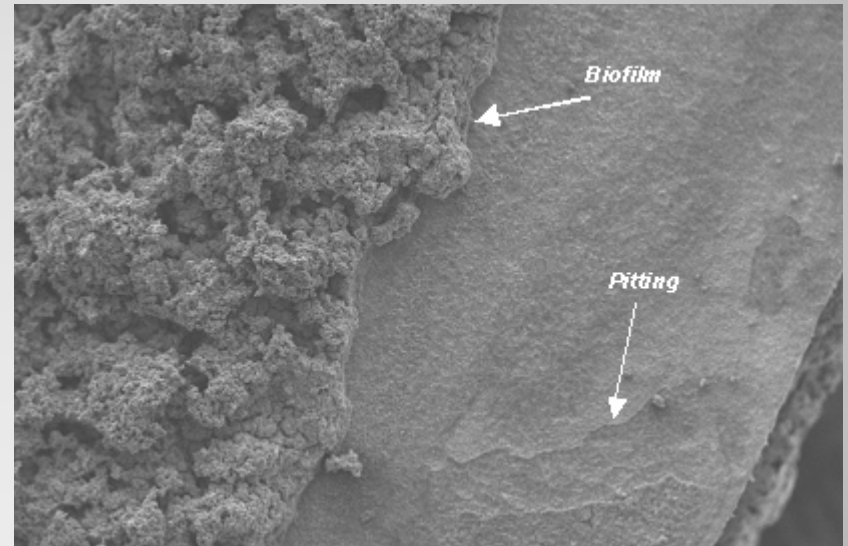
Most pipeline operators and regulators are not as comfortable at addressing internal corrosion for a number of reasons:

- Most corrosion engineers and workers in the pipeline industry come from the external corrosion / cathodic protection arena.
- There are not as many tools available to test and monitor for IC that everyone is comfortable with.

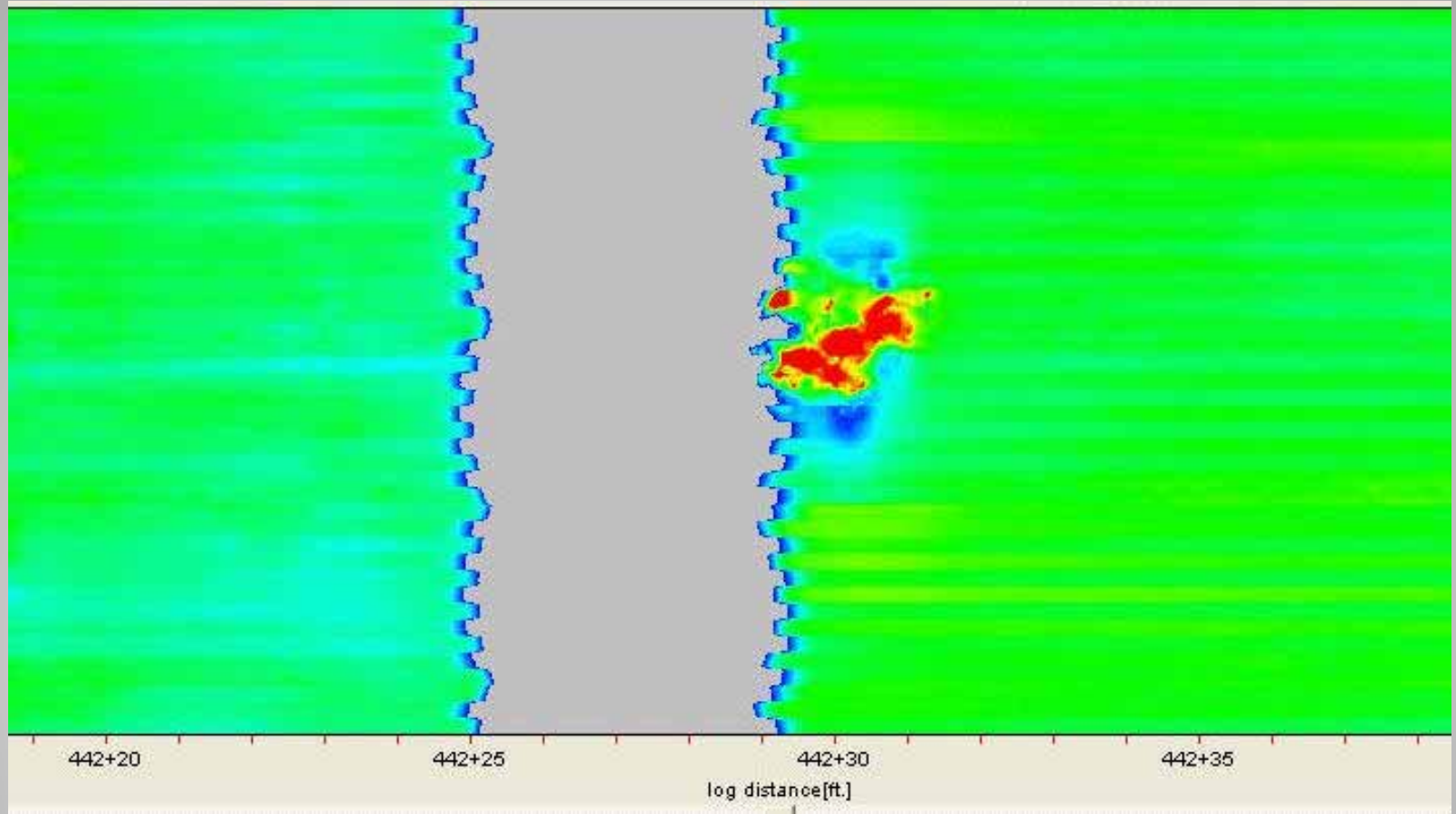


INTERNAL CORROSION – DIFFICULTIES

When bacteria become involved in internal corrosion the level of discomfort among most corrosion professionals is increased.



THE BIGGEST SOURCE OF DISCOMFORT – WE CAN'T SEE IT



INTERNAL CORROSION – History

The major root causes behind an internal corrosion failure can vary but history has shown us that a limited number of major causes:

- Ineffective inhibitor programs
- Insufficient cleaning pigs
- Deadlegs and other areas of low or no flow
- Etc.



ONE OF THE MOST COMMON ROOT CAUSES OF INTERNAL CORROSION FAILURES

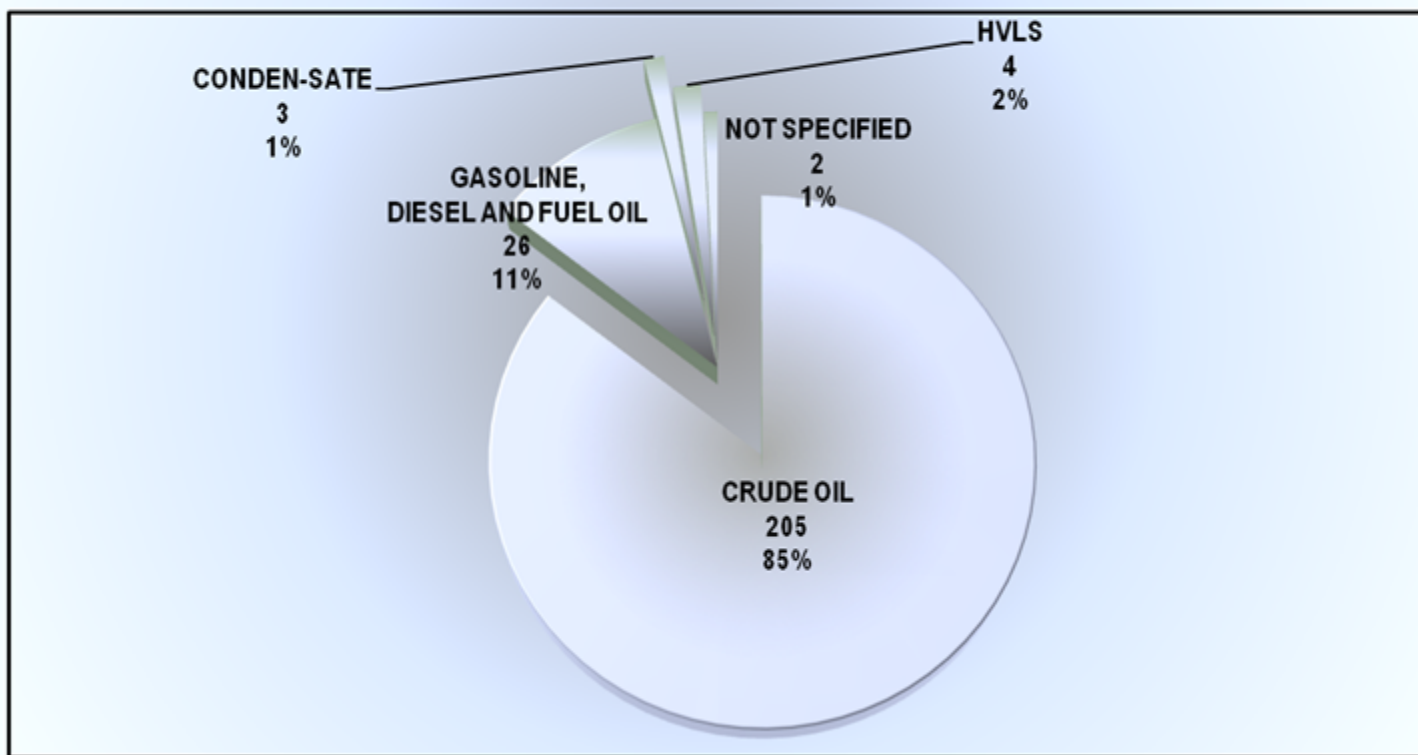
- "It ain't what you don't know that gets you into trouble. It's what you know for sure that just ain't so." – Mark Twain/Yogi Berra
- Too often the product in a pipeline is considered non-corrosive so internal corrosion is not considered a threat.
- Ignoring upsets and changing conditions



INTERNAL CORROSION ACCIDENTS COMMODITY TRANSPORTED

SIGNIFICANT INTERNAL CORROSION ACCIDENTS

NUMBER ACCIDENTS: 240 1988-2008



DON'T FORGET ABOUT TANKS



Thank You

- Any Questions?

