What's New with Plastic Piping
May 2023

Plastic Pipe
Database
Committee

About the PPDC

- Collects data on pipe, fitting, and joint failures in plastic piping systems
- Analyzes data related to current plastic piping failures and known historical issues
- Identifies trends to assist Integrity Management Programs

Plastic Pipe Database Committee

Background

- Created in response to NTSB recommendation
- Precondition to PHMSA not mandating collection
- National voluntary database of plastic piping failures
- Administered by AGA on behalf of PPDC

Plastic Pipe Database Committee

Committee Members

Government Members

- NAPSR Representatives (2)
- NARUC Representatives (2)
- PHMSA/OPS Representatives (2)

Industry Members

- AGA Member Representatives (2)
- APGA Member Representatives (2)
- PPI Member Representatives (2)

- Up to 3 Invited Guests
- 1 NTSB Liaison
- AGA Observer(s)

Plastic Pipe Database Committee

Scope

- The scope of the committee was expanded to include failures and/or leaks of plastic pipe and metal and/or plastic appurtenances contained within plastic piping systems (not to include meters and regulators). The cumulative data supplied by volunteer participants in the Plastic Pipe Data Collection Initiative are examined in aggregate by the PPDC at each meeting to consider plastic system failures and/or leaks unrelated to third-party damage.
- Immediate third-party damages are not collected or evaluated (except where a delayed failure and/or leak occurs after the damage event) since this data is collected by the Common Ground Alliance and it does not provide an indication of the long-term performance of plastic piping material

Plastic Pipe Database Committee

Plastic Pipe Database Committee (PPDC)

- The PPDC meets two to three times per year to review the data.
- Consensus agreements on areas of focus or concern.
- Issues Status Reports after each meeting.
- Provides resources to aid in identification of products and to assist operators with Integrity Management Programs.

Plastic Pipe Database Committee

Status of Participation

Currently updating the number of submitters- Plan on having it completed by the end of 2024

In May 2018, the count was 119 - Participants are listed in Appendix A of the status report

We estimate in the U.S. these operators cover

- **76% of plastic mains**
- **85% of plastic services**

Plastic Pipe Database Committee

Accuracy and Completeness of Data VERY IMPORTANT

- Impacts analysis and conclusions
  - Installation Date/Year
  - Failure Cause
  - Manufacturer
  - Unknowns
- Needs full cooperation of participants to help resolve submitted data issues
- Increasingly important with Integrity Management Programs

Plastic Pipe Database Committee

Accuracy and Completeness of Data VERY IMPORTANT

- The PPDC Report Form requests information related to plastic piping system failure. The report form can be found at https://www.aga.org/natural-gas/safety/promoting-safety/plastic-pipe-data-collection-initiative/
- Definitions document explains the information requested on the report form

Plastic Pipe Database Committee

Accuracy and Completeness of Data VERY IMPORTANT

- The PPDC has created various tools to assist operators with data submission
- Plastic Pipe Timeline contains events affecting use of plastic piping in distribution systems. The timeline can be found at PowerPoint Presentation (aga.org)

Plastic Pipe Database Committee

Manufacturers Database

https://plasticpipe.org/common/Uploaded%20files/1-PPI/Divisions/Energy%20Piping%20Systems/Division%20Publications/Energy%20Related%20PPI%20Literature/Misc.%20Energy%20Piping%20Systems/ppdc-mfg-database.pdf

Another tool is the Manufacturers Database

Manufacturers of Plastic Piping Products - Pipe

NOTE: Operators are required to install materials that meet current requirements

Company	Material Designation	From	To	Size Range	Comments
Allied	PE 3306/3406	1965/66	1972/73	1/2" CTS - 2" IPS	Was also a resin producer and supplied the AC ultra high molecular pipe compound to several small pipe extruders including Yardley, Orangeburg, Endot and the Barrett Division of Allied (also an extruder of PVC pipe). Except for Endot, most of these producers/extruders have since gone out of business or have different names today. Pipe was very difficult to fuse.
Amstan	PE3306	Mid-late 1960s			

Plastic Pipe Database Committee

Manufacturers Database

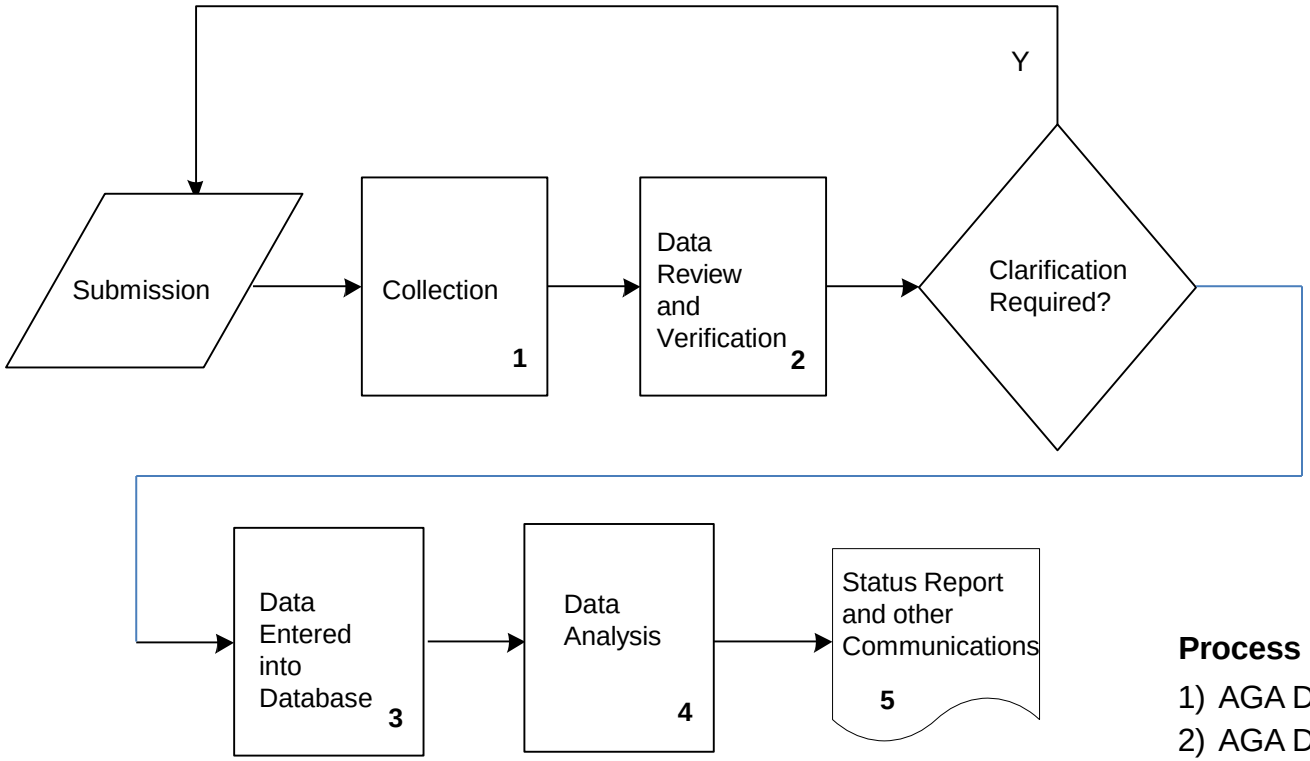
Manufacturers of Plastic Piping Products - Other fittings

NOTE: Operators are required to install materials that meet current requirements

Company	Material Designation	From	To	Size Range	Comments
AMP	Dupont Zytel ST-801				1970's, stainless steel and nylon compression fitting. Technology purchased by Metcal in 1990; can be white in appearance. Dupont Zytel ST-801
	Nylon	??	??	1/2" CTS - 2" IPS	Black with Stainless Steel compression ring. Nylon 66
Georg Fischer Central Plastics					Electrofusion and heat fusion fittings, transition fittings, meter risers.

Plastic Pipe Database Committee

Plastic Pipe Database Committee
Data Process Flow



Process Responsibilities

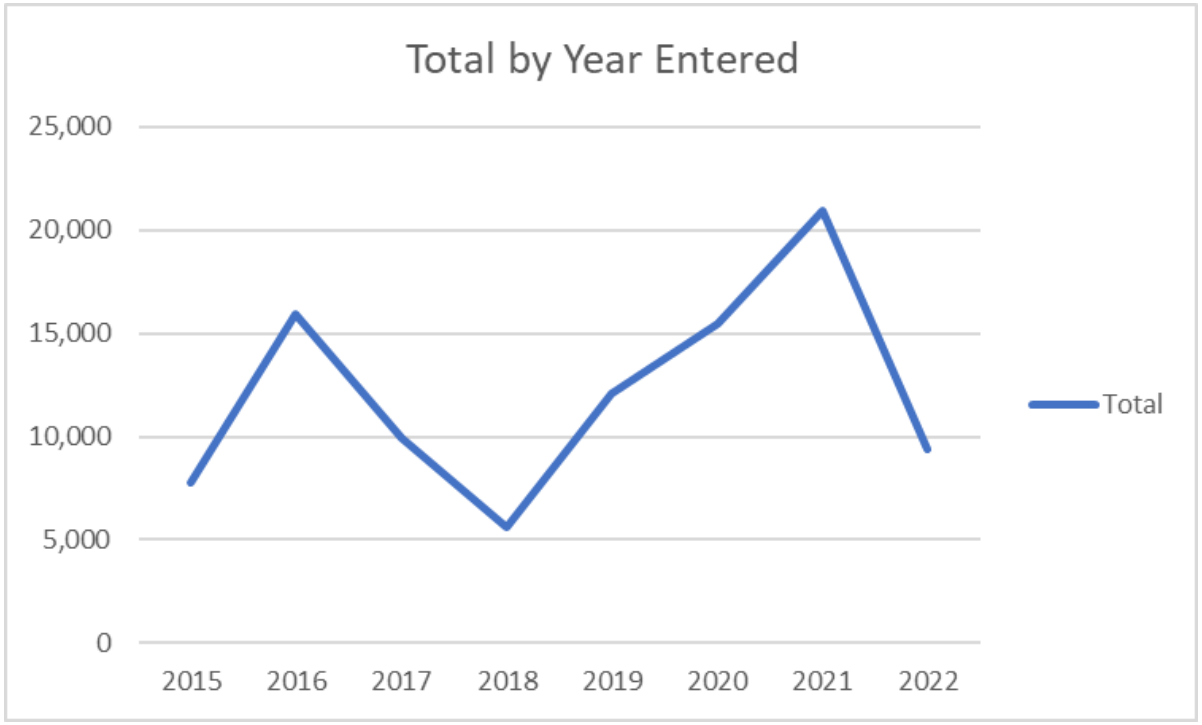
1) AGA Data Collection Team
2) AGA Data Collection Team
3) AGA Data Collection Team
4) Plastic Pipe Database Committee
5) AGA Data Collection Team / PPDC

Plastic Pipe Database Committee

Summary of Database

The PPDC began gathering data in 2000

- Over 142,000 data reports as of March 2023
- More than four 5-year leak survey cycles
- Adding approximately 8,000 reports annually

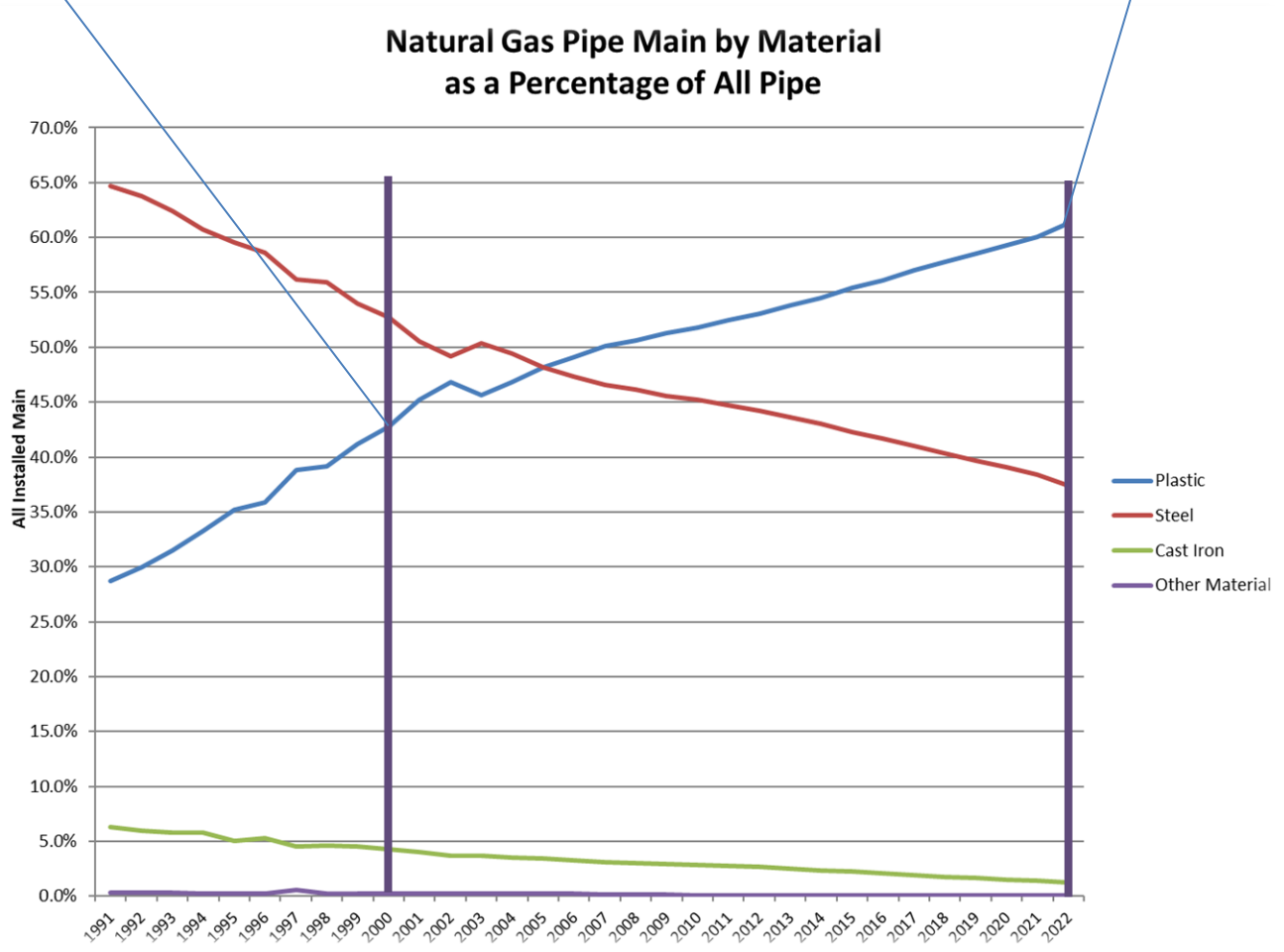


Plastic Pipe Database Committee

PHMSA Database

Plastic 42.8% of all mains
Total miles of Plastic main = 449,425

Plastic 61.3% of all mains
Total miles of Plastic main = 839,623



PHMSA annual report data downloaded 4/20/2023

Plastic Pipe Database Committee

Summary of Database

- Status Report includes analysis of specific data
  - Failures on newly installed pipe
  - ABS, PVC and PE leaks by component and cause
  - DuPont & Uponor (Aldyl A)
  - Century
  - PE 3306
  - AMP
  - Caps
  - PVC
  - Kerotest
  - Driscopipe® HDPE Pipe

Plastic Pipe Database Committee

Unknowns in Database

- **Manufacturer – 58.4% when leak location is Pipe**
- **Manufacturer – 7.4% when leak location is Joint**
- **Manufacturer – 5.6% when leak location is Fitting**
- **Installation Method – 47.5% when a leak is reported**
- **Year Installed – 45.8% when a leak is reported**
- **Material Type – 7.4% when a leak is reported**

Plastic Pipe Database Committee

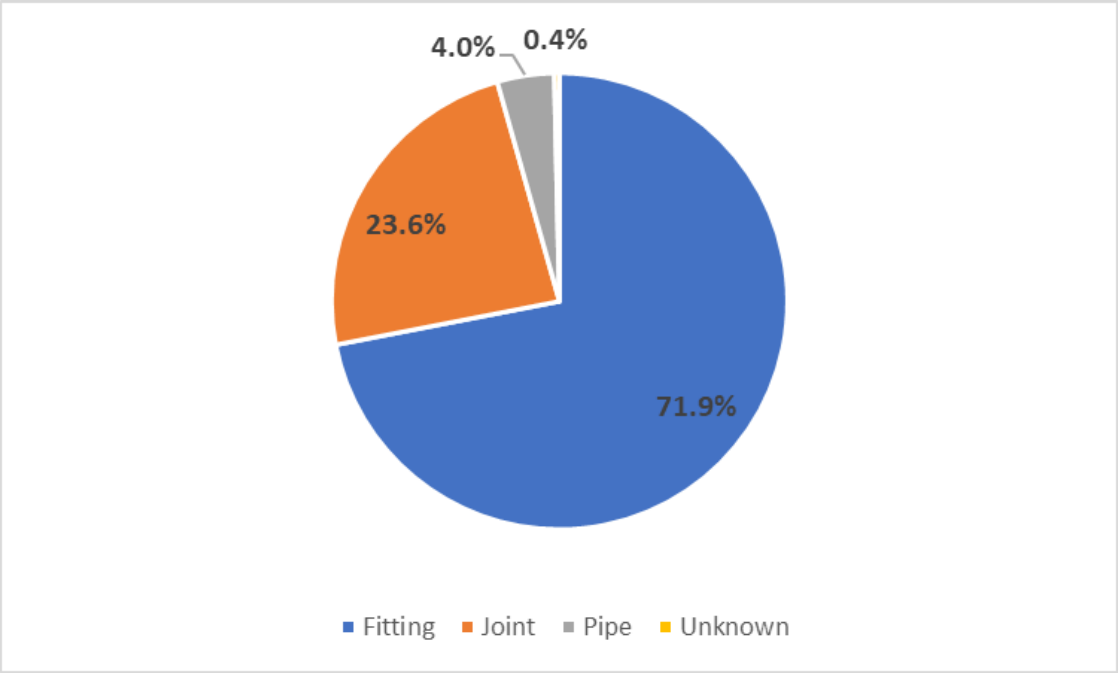
New Installations

- Installation Error is reported as the cause for 40% of all failures occurring within 5 years of installation
- Emphasis should be continued for Operator Qualification Programs, training programs, installation procedure reviews, and inspection efforts

Plastic Pipe Database Committee

PVC Failures by Location

According to data submitted to PHMSA on annual reports, mileage for PVC has been decreasing since 2000. Approximately 9,811 miles of main were reported in 2022



Plastic Pipe Database Committee

PHMSA annual report data downloaded 4/20/2023

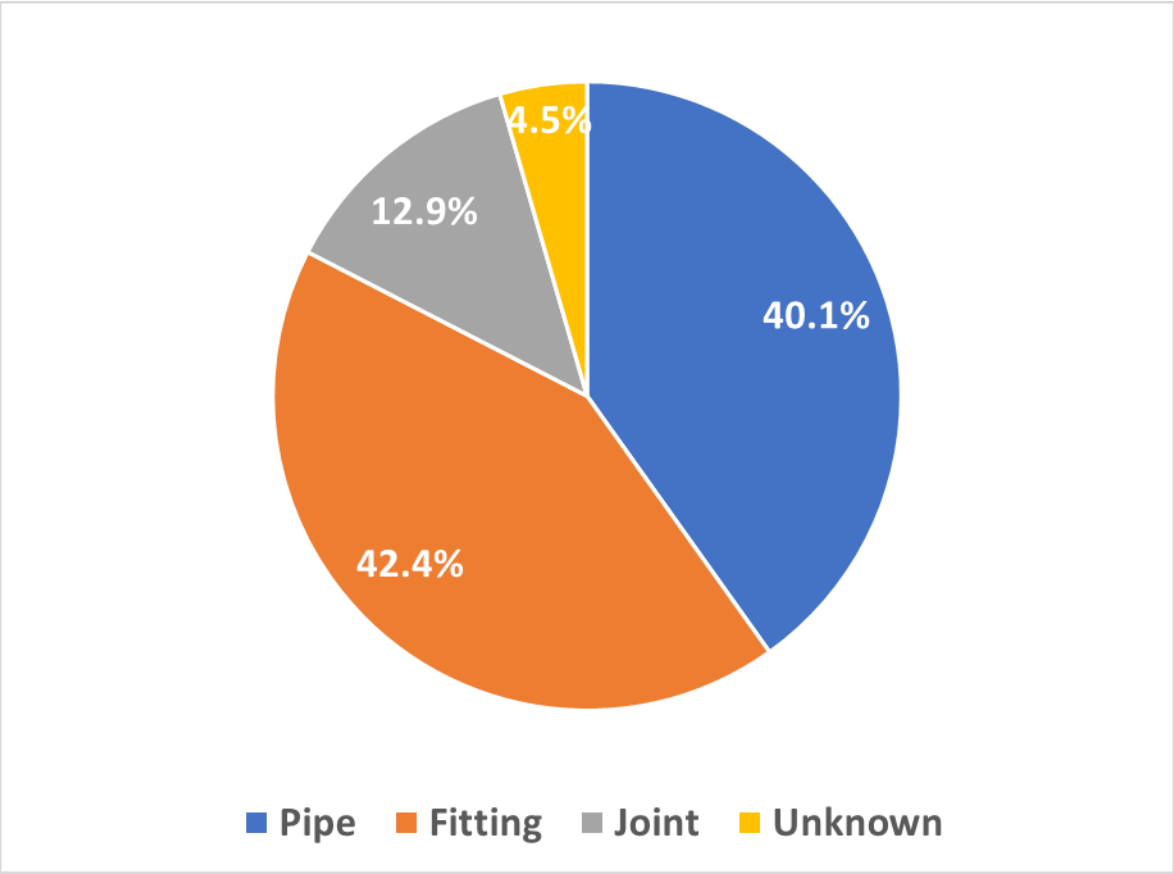
PVC Failure Causes

Cause	% of All PVC Pipe Failures	% of All PVC Fitting Failures	% of All PVC Joint Failures	Total
Cap (Other)	0.0%	0.5%	0.0%	0.3%
Corrosion	0.0%	0.3%	0.2%	0.2%
Excessive Expansion/Contraction	2.7%	2.3%	0.5%	1.9%
Excessive External Earth Loading	17.1%	4.7%	6.7%	5.6%
Installation Error	9.0%	46.6%	19.1%	38.6%
Material Defect	16.2%	36.2%	25.3%	32.8%
Other	3.6%	2.6%	8.1%	3.9%
Point Loading	27.9%	0.4%	1.4%	1.7%
Previous Impact	5.4%	0.5%	0.5%	0.7%
Squeeze Off	2.7%	0.0%	0.0%	0.1%
Threaded Cap (Loose cap, not cracked	0.0%	0.1%	0.0%	0.0%
Threaded Cap (Other, describe)	0.0%	0.5%	0.0%	0.3%
Threaded Cap (Seal/O-ring defect)	0.0%	0.0%	0.3%	0.1%
Unknown	12.6%	5.6%	38.0%	13.5%
Unknown, Not Excavated, Replaced	2.7%	0.1%	0.0%	0.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Plastic Pipe Database Committee

PE
Including DuPont & Uponor, Aldyl A

PHMSA 2022 Annual Report Data: 827,252 Miles of PE Main



PHMSA annual report data downloaded 4/20/2023

Plastic Pipe Database Committee

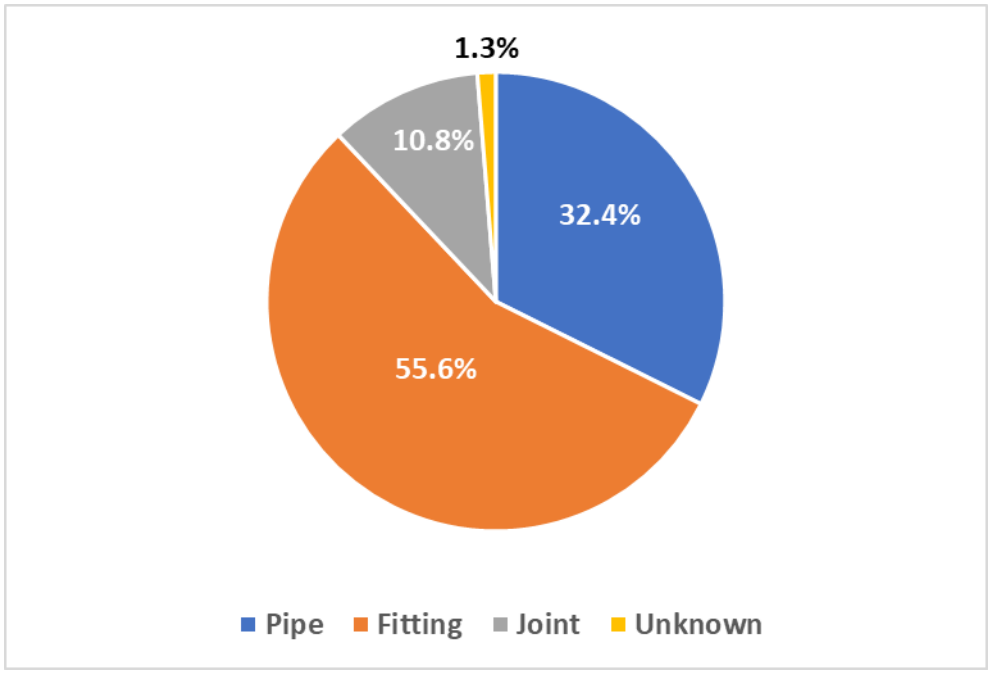
PE Failures Causes

Cause	% of PE Pipe Failures	% of PE Fitting Failures	% of PE Joint Failures	% of All PE Failures
Cap (Other)	0.0%	5.6%	0.0%	2.5%
Corrosion	0.3%	3.9%	0.2%	1.9%
Excessive Expansion/Contraction	0.5%	2.3%	11.3%	2.8%
Excessive External Earth Loading	5.5%	3.1%	3.2%	4.1%
Gopher/rodent/worm damage	0.7%	0.0%	0.0%	0.3%
Installation Error	5.5%	24.3%	52.3%	20.2%
Material Defect	11.4%	15.0%	8.3%	12.6%
Other	8.6%	11.2%	4.1%	9.2%
Point Loading	9.3%	1.6%	1.7%	4.9%
Previous Impact	2.7%	0.2%	0.2%	1.3%
Squeeze Off	3.3%	0.1%	0.1%	1.4%
Threaded Cap (Cracked Cap)	0.0%	1.4%	0.0%	0.6%
Threaded Cap (Loose cap, not cracked)	0.0%	4.5%	0.0%	2.0%
Threaded Cap (Other, describe)	0.0%	0.4%	0.0%	0.2%
Threaded Cap (Seal/O-ring defect)	0.0%	0.9%	0.3%	0.4%
Unknown	51.3%	25.0%	17.9%	35.1%
Unknown - Abandoned	0.2%	0.1%	0.0%	0.1%
Unknown, Not Excavated, Replaced	0.6%	0.4%	0.2%	0.5%
% of All PE Failures	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Plastic Pipe Database Committee

DuPont & Uponor, Aldyl A

DuPont and Uponor, Aldyl A, piping is not identified as separate from other types of polyethylene in the PHMSA Annual Report information. However, the PPDC includes DuPont and Uponor as manufacturers – Aldyl A is approximately 25% of the database.



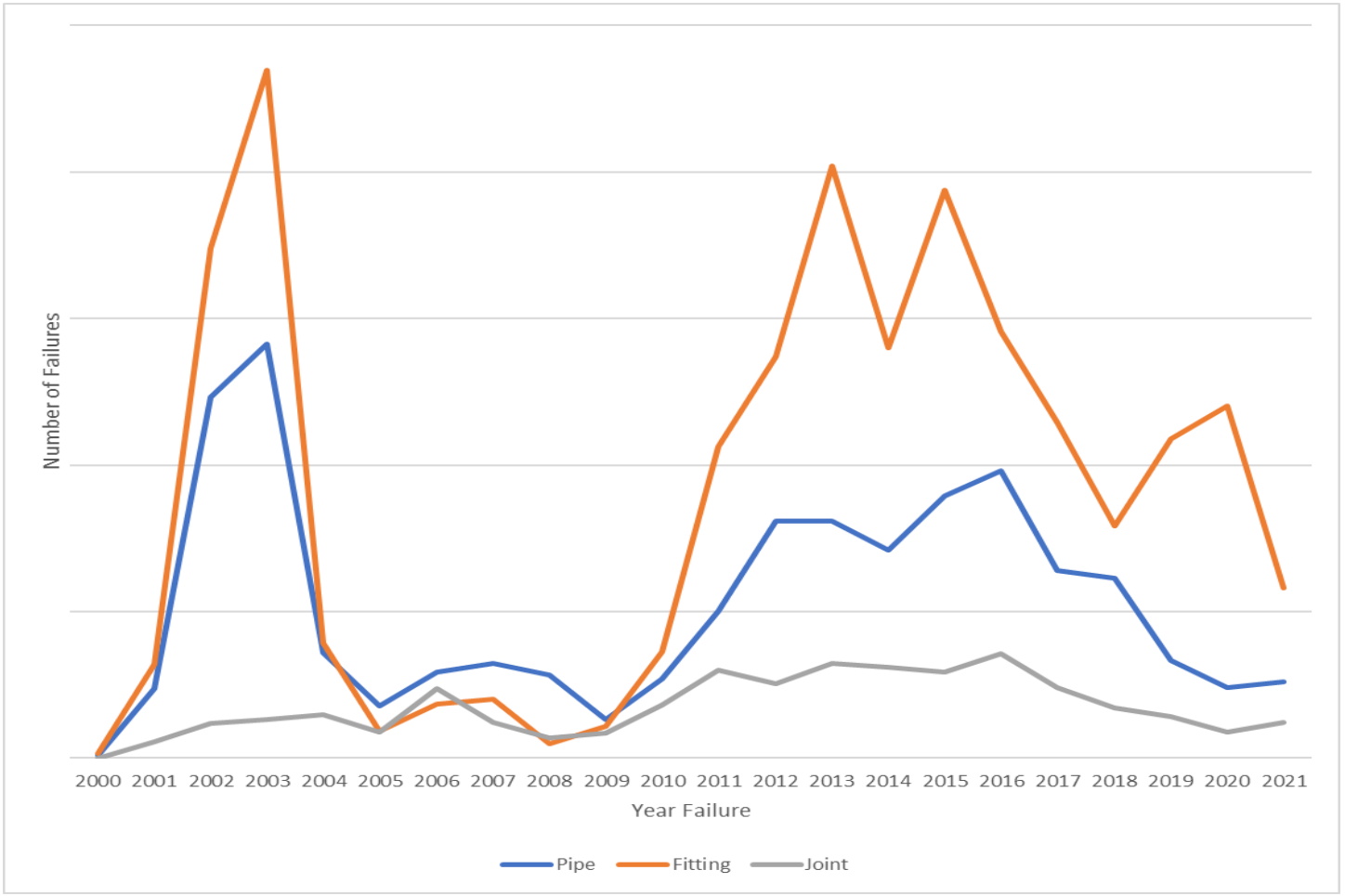
Plastic Pipe Database Committee

DuPont & Uponor, Aldyl A, Causes

Cause	% of Aldyl Pipe Failures	% of Aldyl Fitting Failures	% of Aldyl Joint Failures	% of All Aldyl Failures
Cap (Other)	0.0%	4.9%	0.0%	2.8%
Corrosion	1.2%	1.6%	0.1%	1.3%
Excessive Expansion/Contraction	0.9%	1.2%	4.5%	1.5%
Excessive External Earth Loading	14.3%	4.2%	5.5%	7.7%
Gopher/rodent/worm damage	0.4%	0.0%	0.0%	0.1%
Installation Error	12.1%	19.1%	65.2%	21.8%
Material Defect	6.8%	22.0%	5.0%	15.2%
Other	17.3%	16.7%	1.9%	15.3%
Point Loading	22.4%	2.2%	3.9%	9.0%
Previous Impact	4.2%	0.1%	0.4%	1.5%
Squeeze Off	7.6%	0.0%	0.0%	2.5%
Threaded Cap (Cracked Cap)	0.0%	9.7%	0.0%	5.4%
Threaded Cap (Loose cap, not crac	0.0%	1.5%	0.0%	0.8%
Threaded Cap (Other, describe)	0.0%	0.1%	0.0%	0.0%
Threaded Cap (Seal/O-ring defect)	0.0%	1.1%	0.0%	0.6%
Unknown	11.4%	15.3%	13.1%	13.8%
Unknown - Abandoned	0.3%	0.0%	0.0%	0.1%
Unknown, Not Excavated, Replace	1.1%	0.3%	0.4%	0.6%
% of All Aldyl Failures	**100.0%**	**100.0%**	**100.0%**	**100.0%**

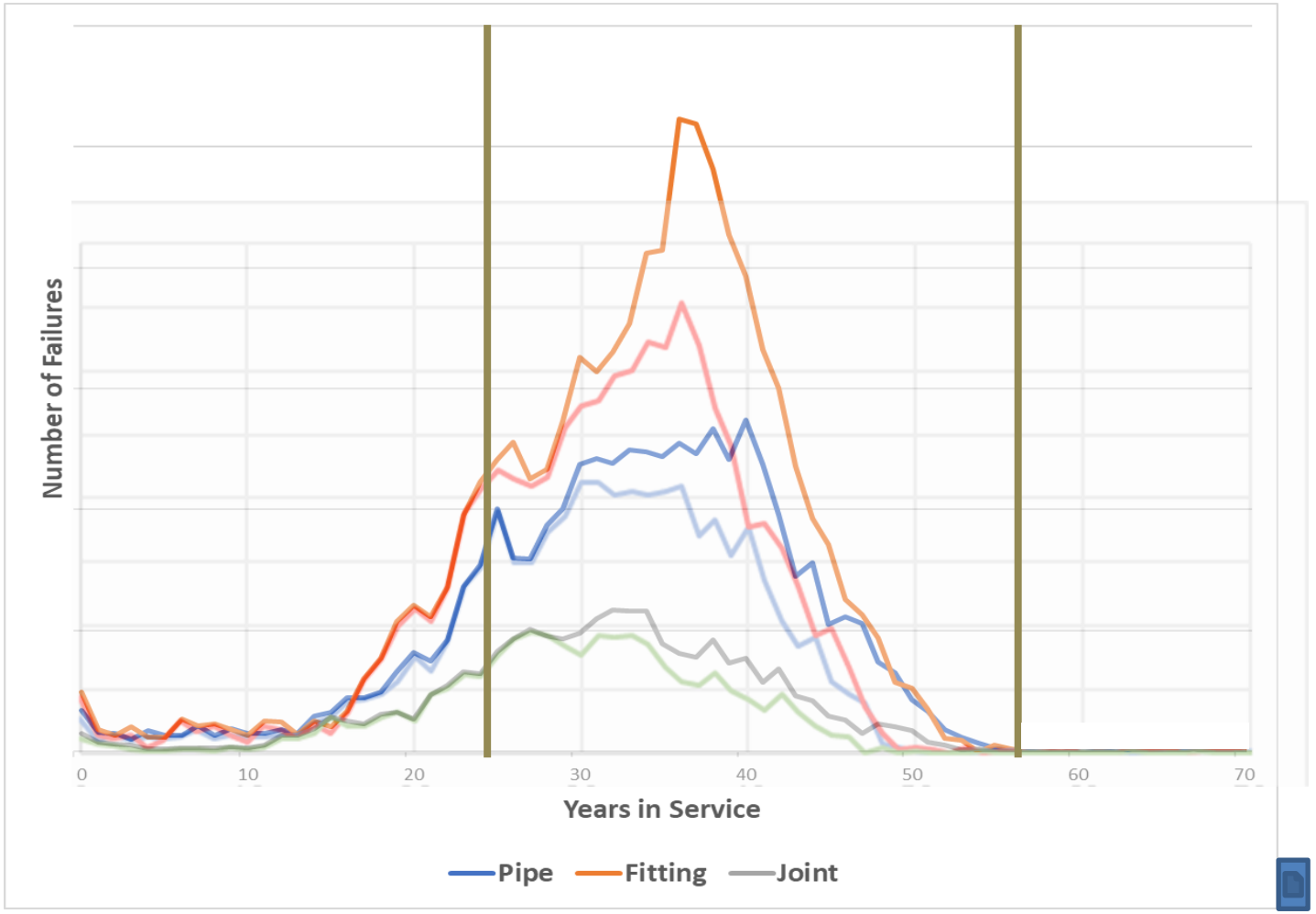
Plastic Pipe Database Committee

DuPont & Uponor, Aldyl A, Failures by Year of Failure/Leak



Plastic Pipe Database Committee

DuPont & Uponor, Aldyl A, Failures by Year in Service



Plastic Pipe Database Committee

Century Failures

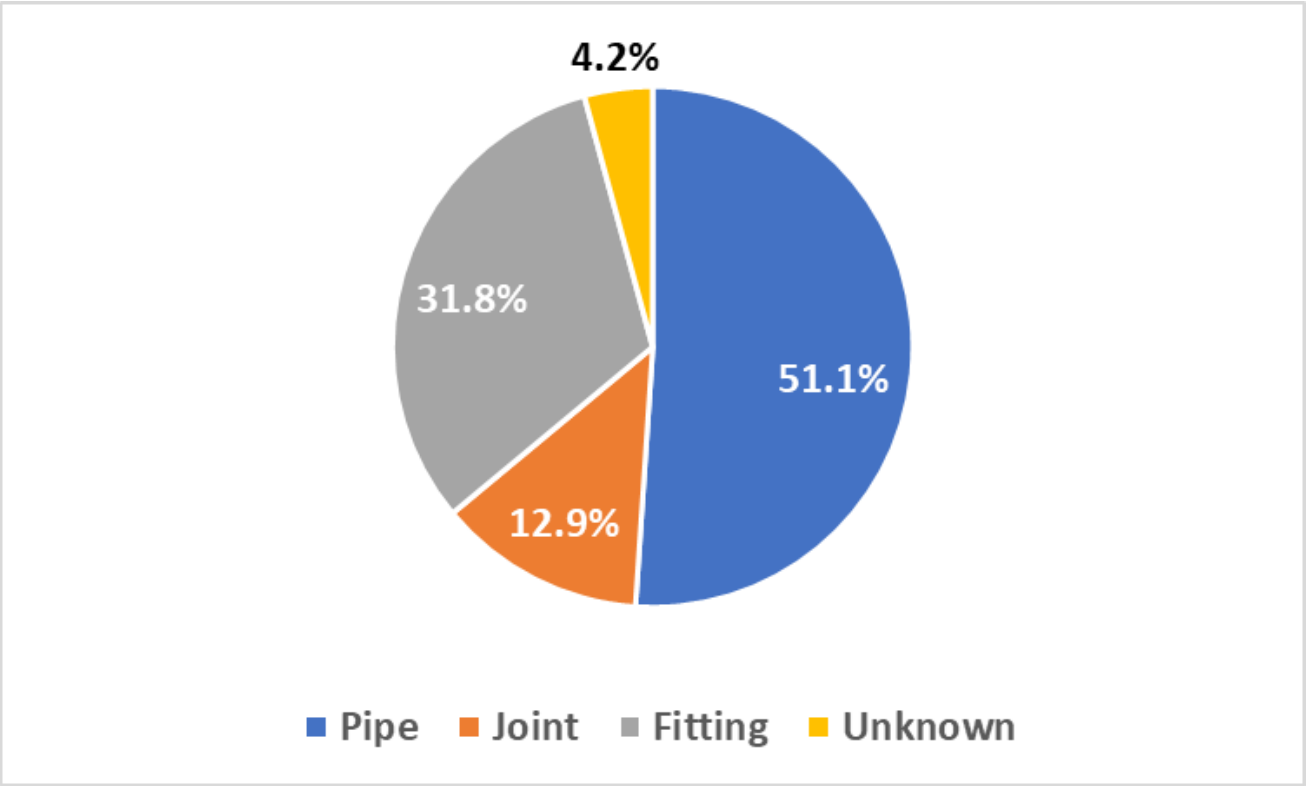
Plastic Pipe Database Committee

Century Failures by Cause

Cause	% of Total Pipe Failure/Leaks	% of Total Fittings Failure/Leaks	% of Total Joints Failure/Leaks	% of Total
Cap (Other)	0.0%	4.8%	0.0%	1.5%
Excessive Expansion/Contraction	0.0%	1.2%	0.0%	0.4%
Excessive External Earth Loading	0.7%	0.0%	0.0%	0.4%
Installation Error	14.0%	23.8%	41.4%	20.2%
Material Defect	47.3%	45.2%	44.8%	46.4%
Other	28.0%	7.1%	13.8%	19.8%
Point Loading	2.0%	0.0%	0.0%	1.1%
Previous Impact	0.7%	0.0%	0.0%	0.4%
Threaded Cap (Cracked Cap)	0.0%	1.2%	0.0%	0.4%
Threaded Cap (Seal/O-ring defect)	0.0%	1.2%		0.4%
Unknown	7.3%	15.5%	0.0%	9.1%
Total	100.0%	100.0%	100.0%	100.0%

Plastic Pipe Database Committee

PE 3306 Failures



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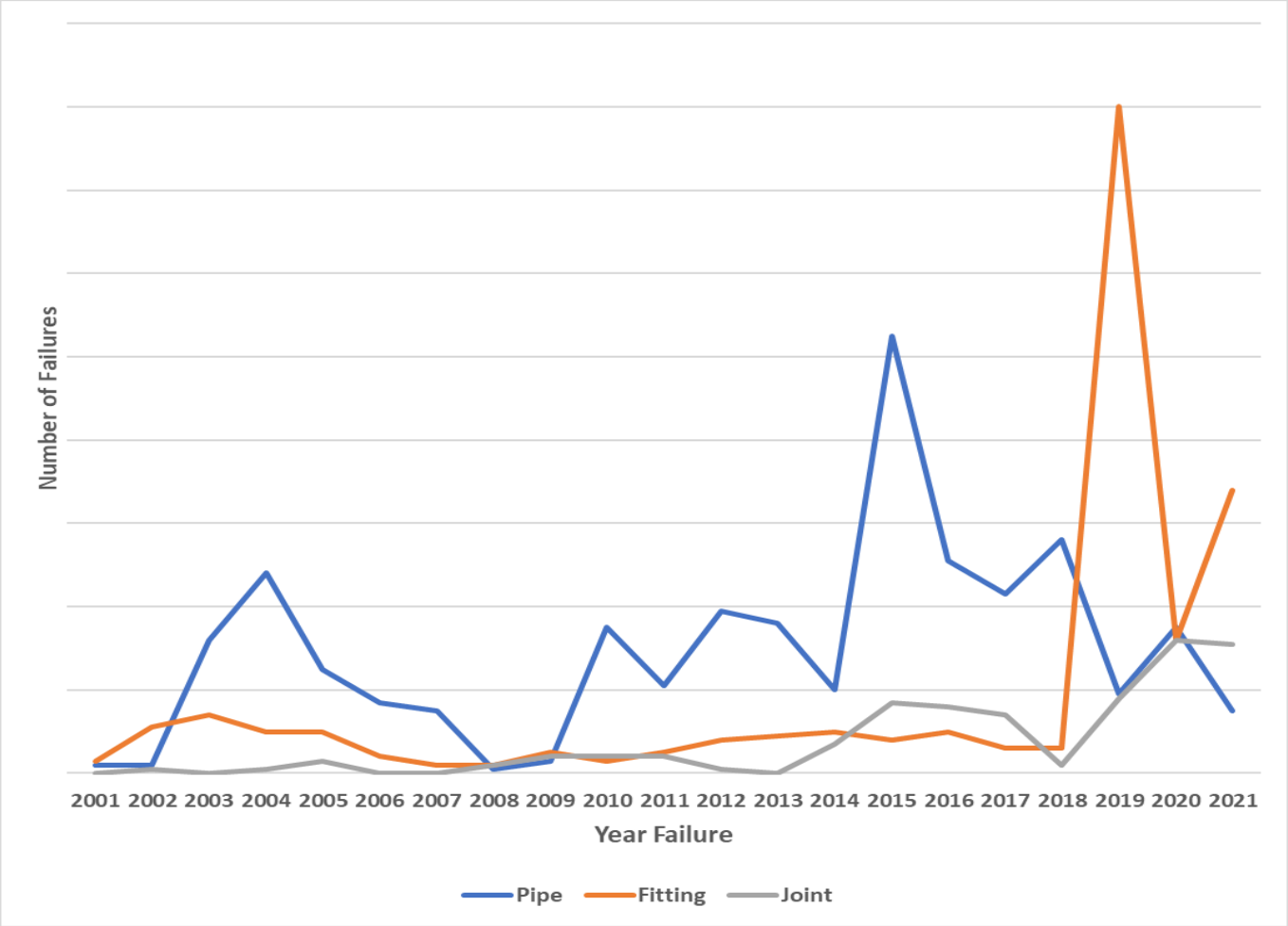
PE 3306 Failures



Plastic Pipe Database Committee

PE 3306 Failures by Cause

Cause	% of All PE3306 Pipe Failures	% of All PE3306 Fitting Failures	% of All PE3306 Joint Failures	% of All PE 3306 Failure / Leaks Total
Corrosion	0.2%	7.5%	0.0%	2.6%
Excessive Expansion/Contraction	0.8%	8.2%	24.7	6.5%
Excessive External Earth Loading	9.0%	2.1%	3.2%	5.9%
Installation Error	1.0%	18.8%	30.4%	10.8%
Material Defect	5.0%	12.1%	12.0%	8.3%
Other	7.4%	4.9%	17.7%	7.9%
Point Loading	22.4%	2.1%	0.6%	12.7%
Previous Impact	1.0%	0.3%	0.0%	0.6%
Squeeze Off	39.4%	1.8%	0.0%	21.6%
Threaded Cap (Cracked Cap)	0.0%	5.4%	0.0%	1.8%
Threaded Cap (Loose cap, not cracked)	0.0%	12.6%	0.0%	4.2%
Threaded Cap (Other, described)	0.0%	0.3%	0.0%	0.1%
Threaded Cap (Seal/O-ring defect)	0.0%	1.0%	3.8.0%	0.9%
Unknown	13.1%	23.1%	7.6%	15.7%
Unknown- Abandoned	0.6%	0.0%	0.0%	0.3%
Unknown - Not Excavated, Replaced	0.3%	0.0%	0.0%	0.2%
% of All PE 3306 Failure /Leaks Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Plastic Pipe Database Committee

Cap Failures by Cause

Cause	% of DuPont Caps Failures	% of Plexco Caps Failures	% of Other Manufacturer Caps Failures
Cap (Other)	10.3%	10.3%	16.4%
Excessive Expansion/Contraction	1.4%	0.6%	4.2%
Excessive External Earth Loading	0.2%	0.5%	0.3%
Installation Error	9.8%	5.4%	17.8%
Material Defect	33.8%	37.4%	11.6%
Other	4.0%	6.9%	1.7%
Point Loading	0.2%	0.2%	0.1%
Threaded Cap (Cracked Cap)	20.6%	20.3%	8.3%
Threaded Cap (Loose cap, not cracked)	3.1%	2.2%	21.9%
Threaded Cap (Other, describe)	0.2%	0.0%	2.8%
Threaded Cap (Seal/O-ring defect)	2.8%	2.4%	3.9%
Unknown	13.4%	13.7%	10.9%
Unknown – Abandoned	0.0%	0.1%	0.1%
Unknown - Not Excavated, Replaced	0.1%	0.0%	0.1%
Grand Total	**100.0%**	**100.0%**	**100.0%**

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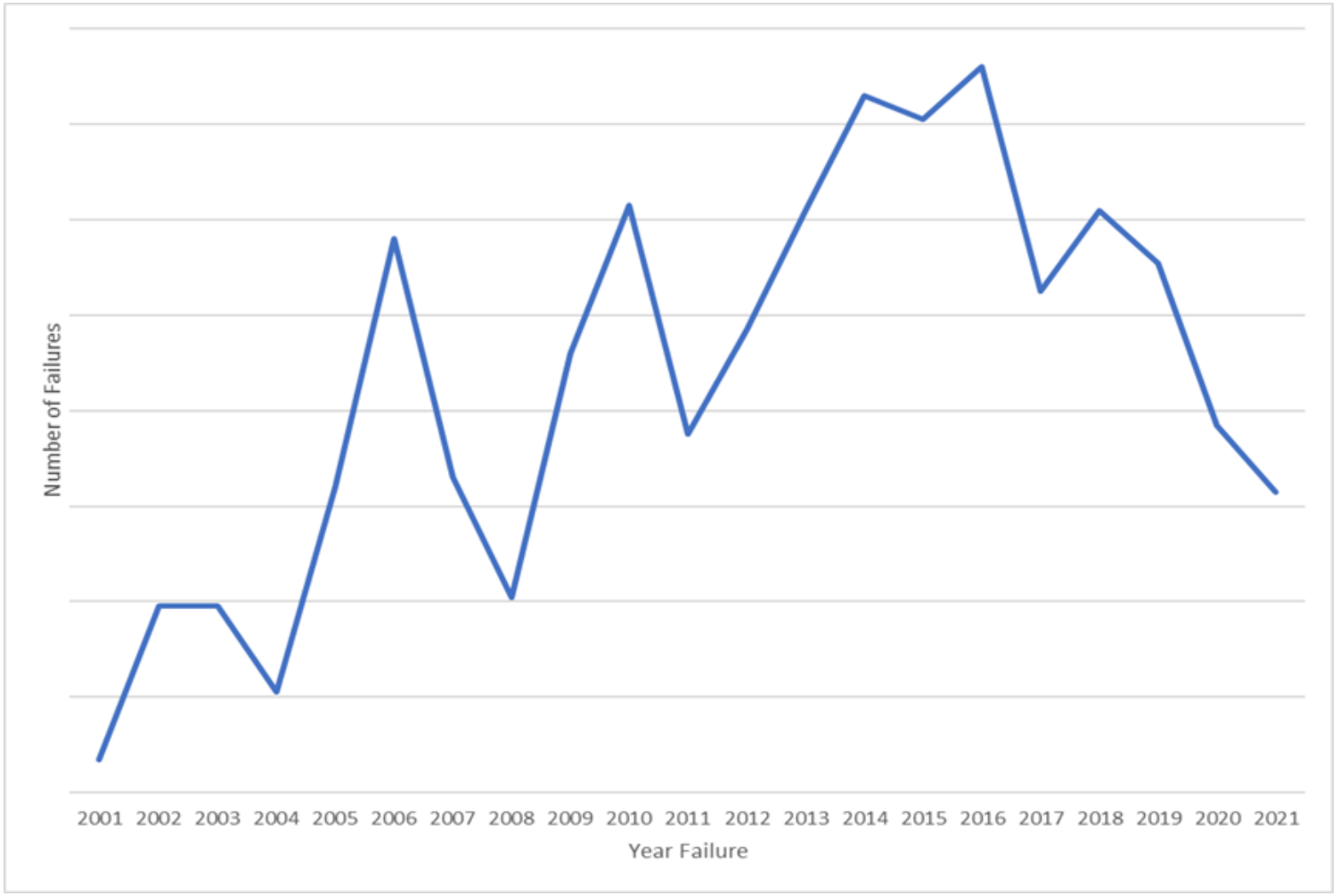
Amp Failures



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Amp Failures by Cause

Cause	% of Total AMP Failure
Cap (Other)	0.1%
Corrosion	0.4%
Excessive Expansion/Contraction	4.2%
Excessive External Earth Loading	13.3%
Installation Error	12.0%
Material Defect	42.2%
Other	5.1%
Point Loading	0.8%
Previous Impact	0.1%
Threaded Cap (Cracked Cap)	0.1%
Threaded Cap (Loose cap, not cracked)	0.1%
Threaded Cap (Seal/O-ring defect)	0.3%
Unknown	21.3%
Unknown - Not Excavated, Replaced	0.1%
Total	**100.0%**

Plastic Pipe Database Committee

Examples of Questions Received by PPDC

PPDC Answers questions from any interested party

The following question and response were reviewed by the PPDC at their October 2022 meeting.
Question from Okaloosa Gas: Have companies experienced internal degradation of the Drisco 8000 series pipe? Okaloosa Gas has experienced the occurrence of degradation of the Drisco 8000 series pipe. They have experienced both internal and now external degradation of the 1-1/4" Drisco 8000 pipe. The incidents are tied to late 80's vintage pipe (87-89).

As you can see from Figures 1 & 2, the internal degradation gives a scaled appearance that results in microfracture leaks. When the pipe is squeezed off, it has a crackling sound which results in more fractures of the pipe. The degradation was on a dead-end line at a low spot in the pipe. Okaloosa Gas has no known history of water intrusion or oils in the area. Figure 3 is an example of the smooth interior of the pipe in the same area. The small specks in the interior are dirt particles. The pipe is shiny and smooth internally.

Figure 2

Figure 1

Figure 3

Figures 4 & 5 show external degradation is a peeling effect of the pipe.

Figure 4

Figure 5

Response from PPDC: A review of current PPDC data does not correspond with internal degradation processes. The PPDC will continue monitoring data for potential Drisco 8000 internal pipe wall issues with cracking and brittleness and external degradation of peeling of the pipe.

Plastic Pipe Database Committee

What does this data mean to you?

192.1007 requires that an operator know their system and consider reasonably available information to identify existing and potential threats.

- NTSB Areas of Concern
  - Century, DuPont Aldyl® A, and PE 3306 pipe
  - DuPont Aldyl® service punch tee with Delrin insert
  - Plexco service tee with Celcon® cap
  - Permalock Tee
- PPDC Identified Areas
  - Ampfit
  - PVC
  - Kerotest
  - Driscopipe® High Density Polyethylene (HDPE)
  - Caps

Plastic Pipe Database Committee

What does this data mean to you?

- Many public gas systems use SHRIMP (Simple Handy Risk-based Integrity Management Plan) in developing their DIM Programs.
- SHRIMP uses PPDC published information as part of its risk determination model. The APGA Security Integrity Foundation (SIF) looks at the data as SHRIMP continues to develop.
- For individual systems, PPDC information can indicate potential areas to examine in evaluating risks as part of a Distribution Integrity Management Program. Some of these are: material failure trends, years in service trends, cause and failure location.

Plastic Pipe Database Committee

How can States use the info?

- Review active submitters and encourage participation from non-participants
- Inquire if issues are relevant to a certain operator and what is being done through DIMP
- Forecast potential issues

Plastic Pipe Database Committee

Pipeline Safety Management System

The PPDC Status report can be used to obtain valuable information on plastic piping and components that might be considered as Operators continue their PSMS journey.

Plastic Pipe Database Committee

For more information, consult AGA's website at https://www.aga.org/natural-gas/safety/promoting-safety/plastic-pipe-data-collection-initiative/

Or Contact

Debbie Ellis dellis@aga.org,
Jeff Meyers, jmeyers@aga.org

Plastic Pipe Database Committee

Questions?

Your participation is valuable to the success of our committee!

Plastic Pipe Database Committee