

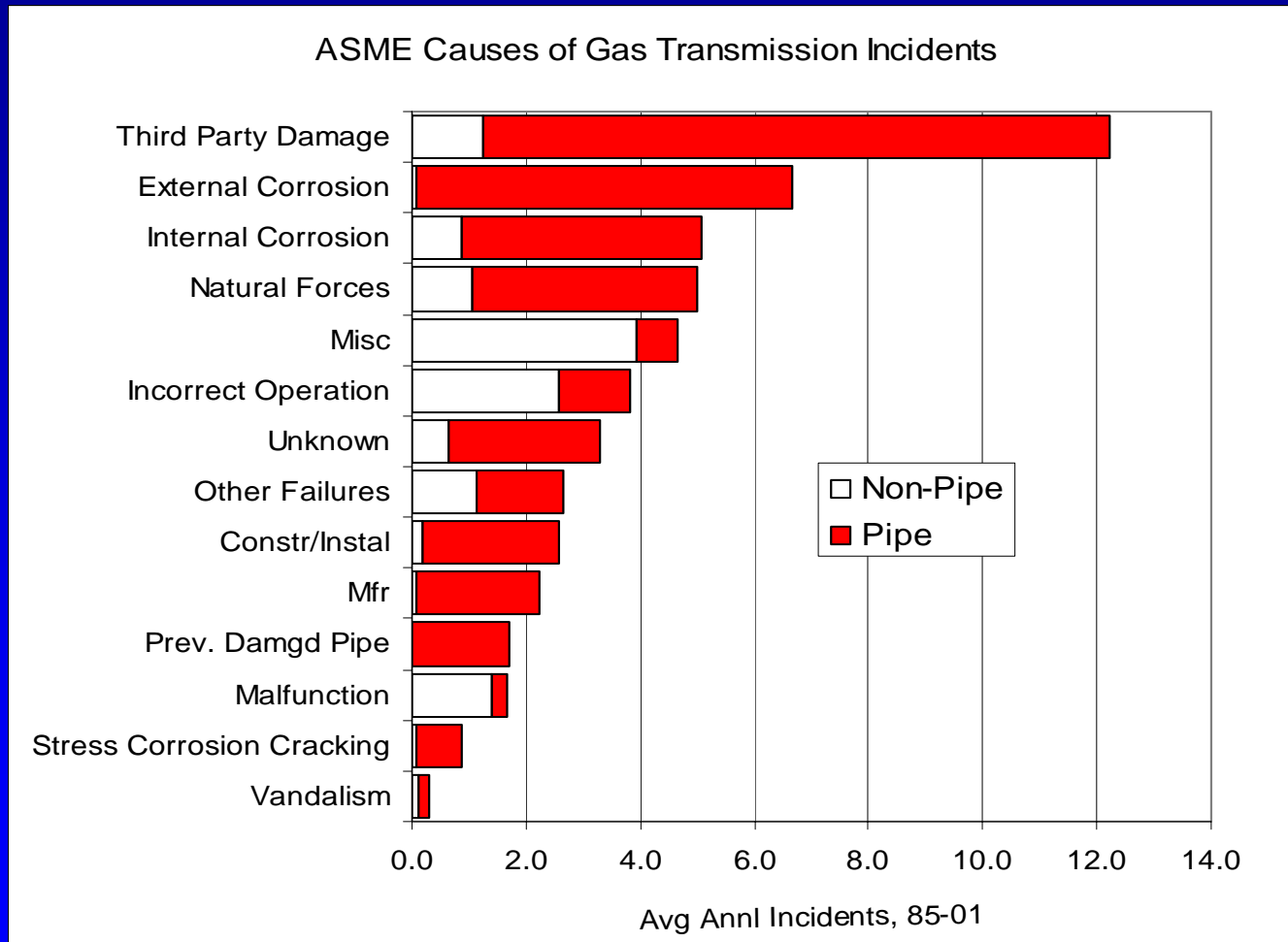
Dents & Third Party Damage

March 14, 2003

Today's Approach

- Review proposed requirements
- Outline challenges inherent in meeting requirements
- Recommend effective approach to mitigate the threat
 - Note that “condition” and “threat” not always synonymous

Summary of Incident Causes



Dents – NPRM Requirements

- Immediate Repair
 - Dent with metal loss, cracking, stress riser
- 180 Day Remediation
 - Dents $> 6\%$ on pipe body
 - Dents $> 2\%$ on a weld

Dents - B31.8S Requirements

- Immediate
 - Dents with gouges
- Scheduled (< 1 year)
 - Dents > 6% on pipe body
 - Dents > 2% on a weld
 - Dents with cracks
 - Mechanical damage

Dents - Risk Factors

- Plain pipe body dents not a risk under most operating conditions
 - Bottom-half dents generally constrained and stable – likely construction-related
 - Fatigue not an issue
 - These are not a significant integrity threat
 - Top-half dents – less constrained or unconstrained
 - Generally very long fatigue lives
 - More an integrity issue if accompanied by mechanical damage

Dents – Risk Factors

- Dents on welds may be more susceptible to fatigue
 - Microstructure and material properties
- Dents with cracks or gouges are subject to unpredictable failure
 - Severity depends on depth of crack or gouge
 - Need prompt investigation / remediation

Dents - Detection

Geometry pigs

- Unlikely to see seam welds – DSAW, ERW
- Can't see mechanical damage – deformation vs cause

MFL pigs

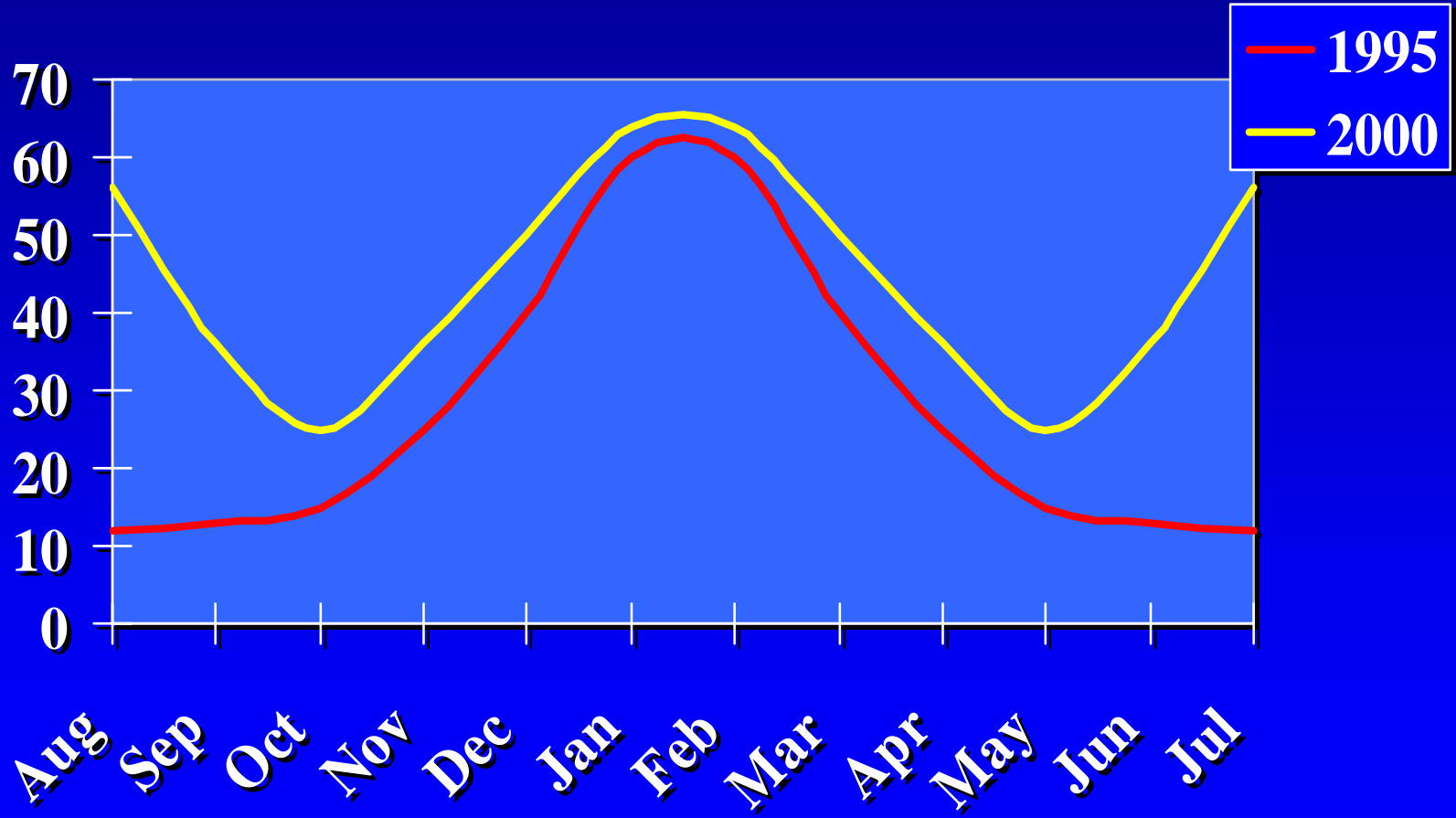
- Unlikely to see seam welds
- Can't see all dents
- Can't size dents
- Loss of resolution due to lift off in dents – wall loss, gouges

Dents - Challenges

Timing of remediation (180 d vs 1 yr)

- 1 yr provides complete operating cycle
- Allows collection and integration of data
- Allows reasonable scheduling of excavation, inspection and repair, subject to
 - Permitting requirements
 - Weather
 - System demands

System Demand Changes



Dents - Challenges

Remediation requirements of conditions that are difficult to accurately characterize

- Additional work being done on dents and fatigue
- Corrosion rate data available to assess deterioration by corrosion

Dents - Recommendations

- Use results of current studies to determine appropriate criteria and possible R&D needs
- Focus on potential threats
 - Unconstrained dents (upper half)
 - Subject to fatigue mechanisms
 - With likely mechanical damage
- Data from ILI (MFL or Geometry)
- Data integration – potential for damage

Third Party Damage - NPRM

Must address through

- Preventive measures
- Assessment tools
 - Deformation or geometry tools
 - DA under certain conditions

Third Party Damage - B31.8S

- High resolution geometry ILI tools can provide some deformation detail
- No success in reliably identifying TPD with MFL tools
- MFL tools not useful for sizing deformations or damage in dents

TPD - Risk Factors

- Significant Factor - ~32% of pipe incidents
- Data indicates 88% of failures are at time of damage (not delayed)
- Delayed TPD failures = 12% of 32% or ~4% of incidents

TPD - Detection

- Deformation & geometry tools noted do not effectively and reliably find TPD
 - Result could be significant expenditure of resources with no commensurate safety benefit
- MFL tools – focus of DOT & PRCI R&D
 - Do not have requisite accuracy or precision in TPD location

TPD - Challenges

- Mandating inspections with marginally effective tools not an appropriate allocation of resources to address 4% of incidents
 - Prevention can impact all TPD incidents
 - 32% of total
- Periodic inspection not effective mgmt
 - Not under pipeline operator control
 - Time-independent occurrence

TPD - Recommendations

- Focus on Prevention - CGA
- Effective measures available and noted
 - One-call systems - use and enforcement
 - NO EXEMPTIONS
 - Enhance excavator education programs
 - Public education
 - Markers
 - Patrols
 - New technology development - surveillance and detection

TPD - Recommendations

Do not mandate inspections specifically targeting TPD

- Review ILI results for possible indications of TPD
- Integrate data as part of RA - ILI indications, crossings, one-call tickets, other excavation or utility activity, etc.
- Investigate and remediate as necessary
- Identify R&D needs / goals