



NASSCO'S PACP/MACP Overview

Irvin Gemora, Executive Director
NASSCO, Inc.
Owings Mills, MD

Rod Thornhill, PE
White Rock Consultants
Dallas, Texas

Summary Of TV Inspection History

- Only been around about 35 years
- Made possible the creation of the trenchless technology industry
- Steadily increasing amount of TV
- Large amount of existing TV data
- Need effective way to manage volume of data

Background of Industry Standardization

- Industry in US had no standards
- NASSCO led effort to develop
- Based on Water Research Centre codes
 - Many years of use in UK
 - WRc providing consulting services to NASSCO
- Standardization concept more important than the benefits of one code system compared to another

Major Deficiencies in Condition Assessment to Date

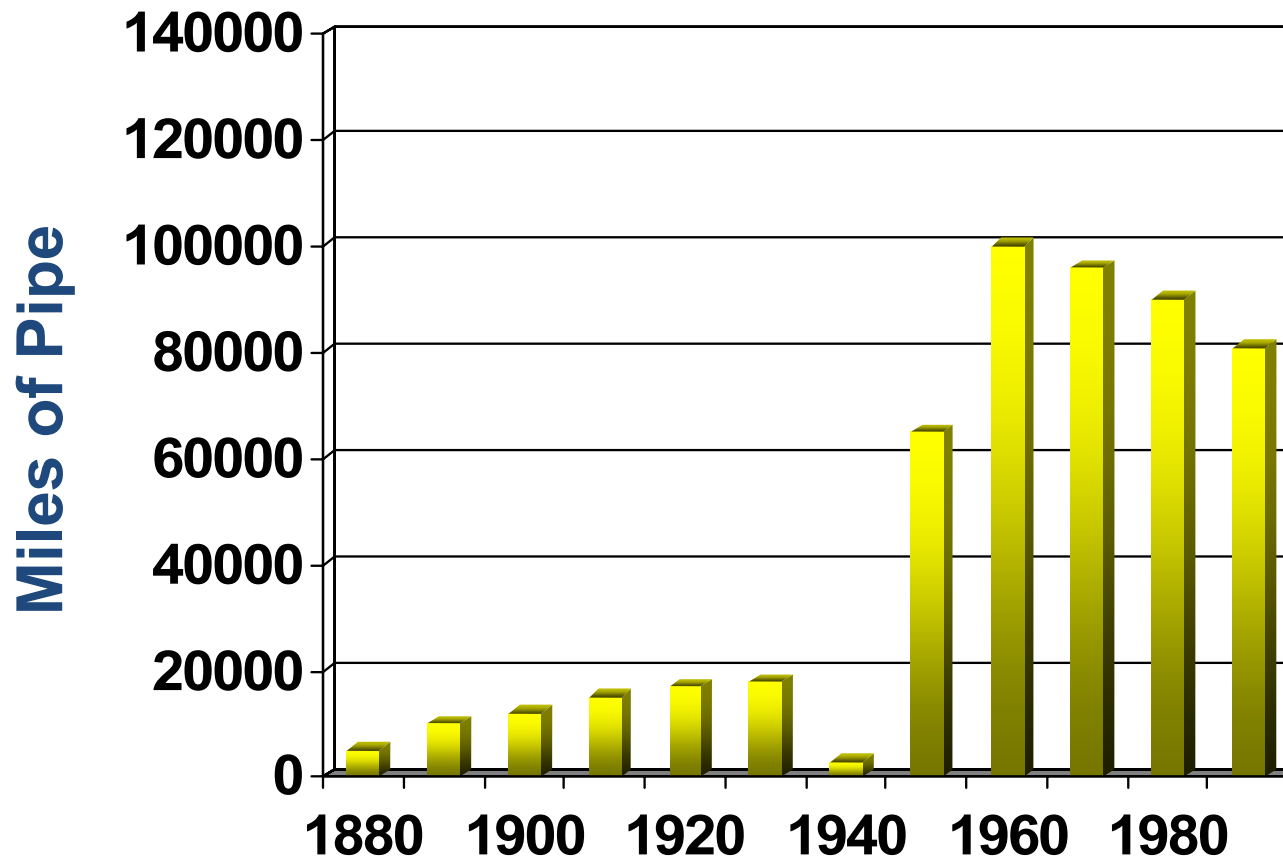
- Majority of sewers in place today were only first televised years after construction
- Many of the defects in pipes were created during construction
- Up until now, the US had no ability to quantitatively measure change in pipe condition

Need for Condition Assessment is Growing

- ASCE “Infrastructure Report Card”
- Water Infrastructure Now (WIN) “Clean Safe Water” Report
- EPA “Gap Analysis” Report
- Congressional Budget Office “Future Investment in Drinking Water and Wastewater Infrastructure” Report



History of Sewer Pipe Installation

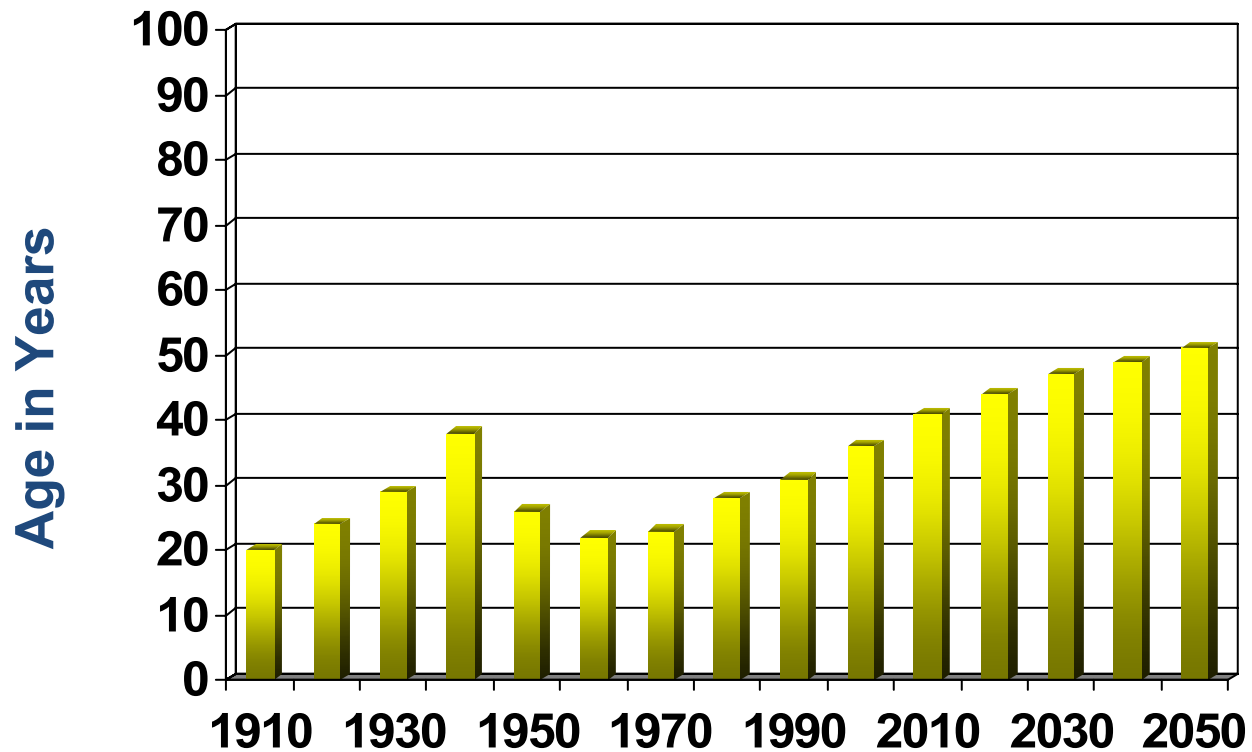


Total Approx
520,000 Miles

EPA Gap Analysis



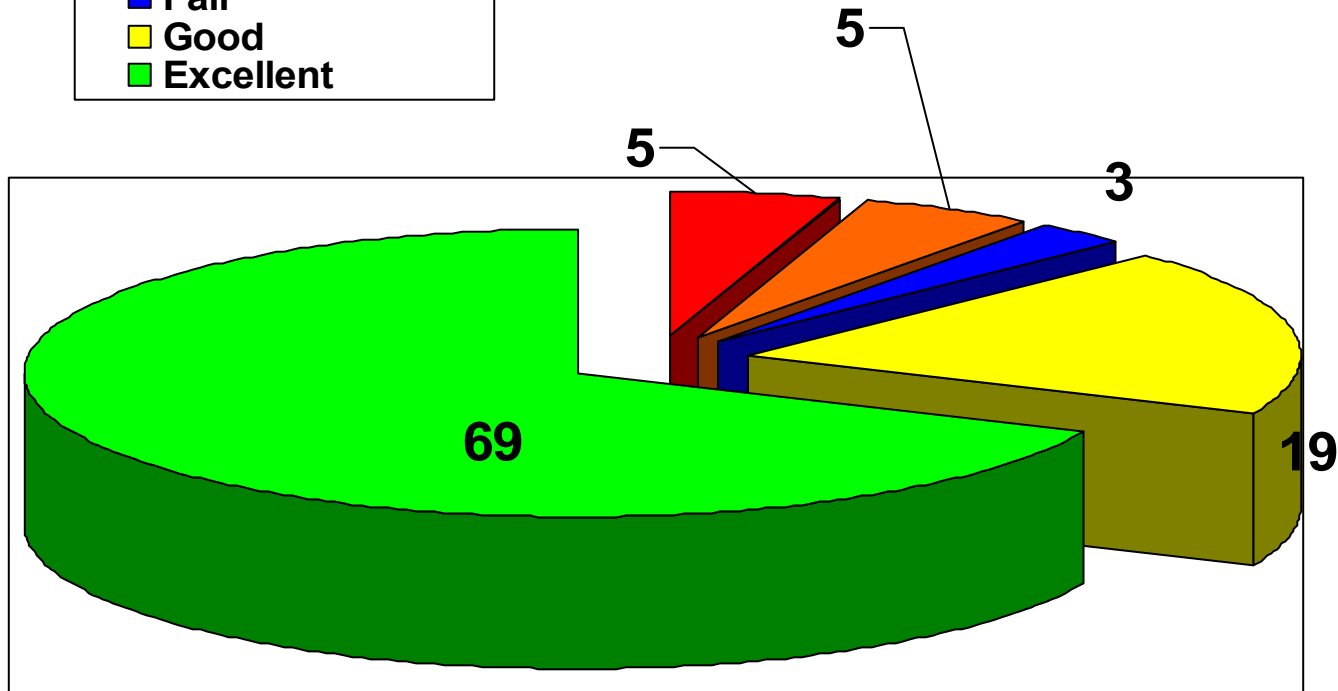
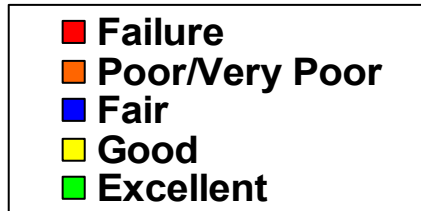
Average Age of Sewer Pipes



EPA Gap Analysis



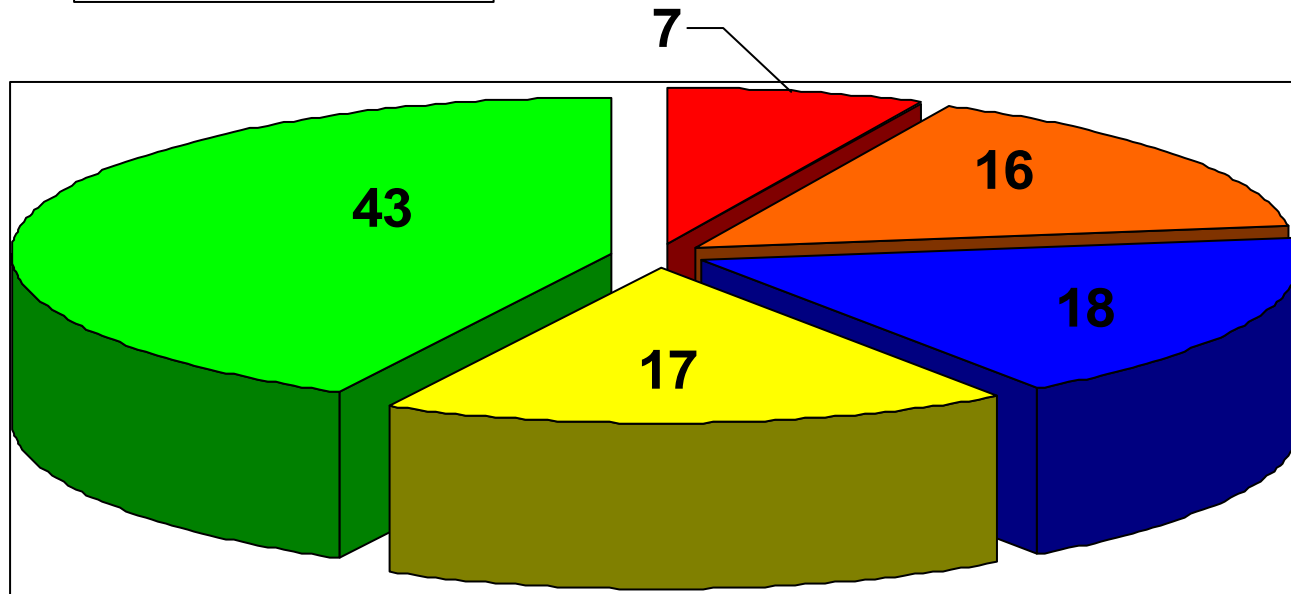
Estimated Condition of Sewer Pipes In 1980





Estimated Condition of Sewer Pipes In 2000

- Failure
- Poor/Very Poor
- Fair
- Good
- Excellent

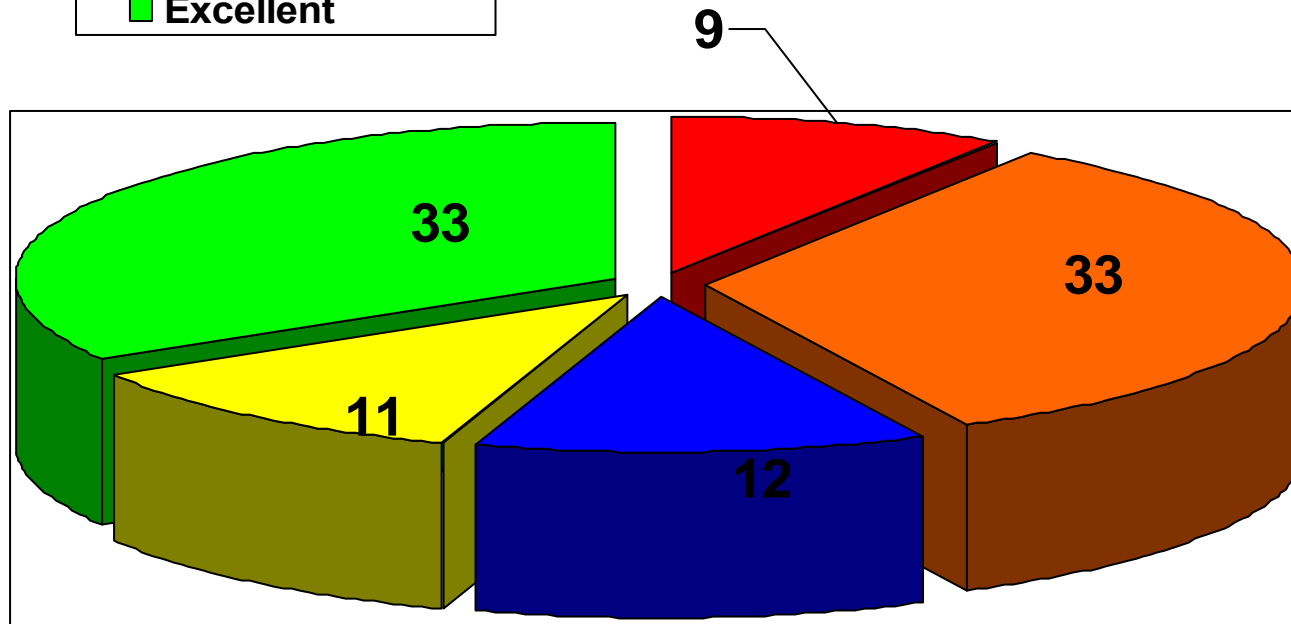


EPA Gap Analysis



Estimated Condition of Sewer Pipes In 2020

- Failure
- Poor/Very Poor
- Fair
- Good
- Excellent



Industry Parallels

- Standard Methods for the Examination of Water and Wastewater (Standard Methods) standardmethods.org
 - Joint Publication of APHA, AWWA, WEF
 - Began in 1905, now in 20th, Edition, 350 separate measurements
 - Product sold as book (\$200) or CD (\$285)

Summary of NASSCO Pipeline Assessment and Certification Program (PACP)

- Modification/Adoption of standard codes and ratings
- Training and certification of operators
- Standard NASSCO data format
- Certification of software vendors
- Guidelines for mapping of data results
- Condition rating for pipelines

History of PACP

- Program initiated by NASSCO in Spring 2000
- Retained assistance from WRc in 2001
- First PACP Committee meeting with WRc in Chambersburg June 2001
- Final PACP Committee meeting week of 9/11 in Atlanta
- First classes in Jan 2002 held in Virginia Beach and UCT.

Training to Date

- Students certified in 2002 405
- Students certified in 2003 540
- Estimated number in 2004 800
- Estimated number in 2005 1200
- Estimated number in 2006 1500
- Estimated number in 2007 1600

- More than 6,000 to date

More Than 200 Utilities Adopting PACP

- Dallas
- Virginia Beach
- Richmond
- Phoenix
- Philadelphia
- Three Rivers WW Program
- New York City
- Austin
- Jackson, Ms
- Las Vegas
- Orange County, CA
- San Antonio

Version 4.2 Certified Software Vendors

- Cobra Technologies
- Flexi-data
- SubCam
- RJN CASSWORKS
- WinCan America
- POSM
- CUES Granite
- Rausch Electronics USA
- MuniXS

Modification/Adoption of standard codes and ratings

- Adapt UK codes to the United States market
- Re-enforce maintenance related defect codes
- Add codes for corrosion evaluation/assessment
- Develop codes specific to rehabilitated sewers

Training and Certification of Users

- Understanding of codes and interpretation of defects
- Use of codes in forms and software
- Two day course with certification exam
- Includes review of pipeline deterioration mechanisms.

Fracture Multiple (FM)

Pipe has a combination of longitudinal and circumferential cracks



Distance (feet)	Video Ref	Code		Continuous defect	Value			Joint	Circumferential location		
		Group / Descrip	Modifier / severity		S/M/L	Inches			%	At / from	To
						1st	2nd				
80.3		FM						J	08	05	

Major Deterioration Factors

- Soil surrounding the pipe
- Position of groundwater table
- Hydraulic regime within the sewer (Surcharging)
- Load on the sewer
- Methods and materials of sewer construction
- 3rd party action
- Roots, grease, debris causing surcharging and necessitating more frequent cleaning

Root Induced Deterioration

- Roots intrude through existing pipe defects
- Root growth expands existing pipe defects and creates new defects
- Root growth can result in blockages and overflows
- Surcharging caused by root growth will accelerate structural deterioration

PACP Data Standards

- Data dictionary defines:
 - Field names
 - Field character number and format
 - Valid field data entries
- Standard Database Format (ACCESS)
- Provide the ability to seamlessly combine data from various projects

Certification of Software Vendors

- All data fields conform to NASSCO standards
- Software has the ability to export seamlessly to NASSCO standard data format and import data from the standard database
- Data exported from one certified software is identical to software from another

Benefits of Pipeline Assessment and Certification Program

- Better data and more efficient operations
- Creates opportunities to better understand sewer system condition and deterioration
- More efficient estimation and bidding
- Sets the stage for deterioration modeling, decision matrix, PM scheduling

PACP Today

- Project-based application of PACP
- Benchmarking of pipe condition within utilities and across the United States
- Recognition as a standard for condition assessment
- Development of case histories of condition assessment over time
- Important tool for understanding sewer deterioration and for long term capital planning

PACP Applications

- GASB 34 Rule Implementation
- Condition Assessment of High Consequence Areas (Critical Sewers)
- Condition-based Preventive Maintenance and Re-inspection
- Pipeline Deterioration Analysis
- Pipeline Condition Mapping
- Population of Other Application Databases

Condition Based Preventive Maintenance and Re-Inspection

- PM selected and scheduled based on what conditions are found
 - Root or Grease Control
 - Routine Cleaning
 - More detailed corrosion assessment
- PM Interval also based on conditions found
 - Allows for a more efficient use of resources
 - Best implemented using computerized maintenance management systems

Pipeline Deterioration Analysis

- A “before” and “after” assessment of a pipeline
- Provides a quantitative understanding of rate of deterioration progression
- Should also include other deterioration factors such as soils, surcharging, groundwater, age, etc.
- PACP standards provide the ability to share with other utilities nation-wide

Pipeline Condition Mapping

- Places location of defects and observations on the sewer map
 - Structural defects
 - O&M defects
 - Construction features
- Display of important pipeline data
 - Size, material, depth, age
 - Pipeline condition ratings
 - Critical sewer rating

Population of Other Application Databases

- Computerized Maintenance Management Systems (CMMS)
- Hydraulic Modeling programs
- Accounting databases (GASB-34)
- SSES Projects
- GIS inventory and Mapping
- Nationwide wastewater pipeline integrity management research

Don't Ignore Retrofitting Existing Data

- Very inexpensive compared to obtaining new data
- Audio and Video often of excellent quality
- Can add up quickly to a considerable portion of the system
- Provides immediate ability to assess rate of deterioration by comparing “old” data to “new”

General Assignment of Pipe Condition Grades

Grade 5	Collapsed or collapse imminent
Grade 4	Collapse likely in foreseeable future
Grade 3	Collapse unlikely in near future
Grade 2	Minimal collapse risk
Grade 1	Acceptable structural condition

Summary

- Standardization will increase confidence in data and the use of the data
- Develop condition ratings and recommended follow-up for every line televised
- Make mapping of results an integral part of the process
- Don't ignore value of the existing TV data
- Help us promote NASSCO industry standards

The Need for Manhole Assessment

- Manholes are most vulnerable to damage
- Proximity to surface increases potential for extraneous flow
- Manhole access is essential for proper collection system maintenance
- Manholes are effectively vertical pipes
 - An 8 foot deep manhole has roughly the same circumferential surface area as 50 feet of 8 inch pipe

Guidance for Manhole Descriptions, Terminology, and Codes

- WEF Collections Systems Committee Manual of Practice 7
- ASCE Manuals and Reports on Engineering Practice No 92, Manhole Inspection and Rehabilitation
- WRc Manual of Sewer Condition Classification 4th Edition, Part B – Manholes and Inspection Chambers
- NASSCO Pipeline Assessment and Certification Program (PACP) Manual

What PACP Brings to MACP

- Using concept that manholes are vertical pipes, many aspects of PACP are relevant to MACP
- Training in conjunction with PACP
- Certification of software vendors
- Addition of MACP data tables to PACP Standard Database
- General approach to grading as used in PACP
- MACP Manual may be stand-alone or a supplement to PACP Manual

Commonality of PACP Codes

- PACP Structural codes relevant to manholes
 - Crack, fractures, broken
 - Missing, displaced brick
 - Corrosion
- PACP O&M codes also relevant to manholes
 - Roots
 - Debris
 - Obstructions
- Visual pipe/lamping inspection will be identical to PACP except for method of referencing distance to observations/defects

Features Unique to MACP

- Categorization of Manhole Components
 - Cover/Lid
 - Frame/Frame Seal
 - Wall
 - Bench
- List of Component Features and Defects
- Construction Materials
- Location Reference Conventions
 - Outgoing pipe at 6 O'clock
 - Distances measured in hundreds, rather than tenths of a foot

Summary

- Manhole Assessment and Certification Program (MACP) will fill a vital role in the advancement of sewer asset management
- Combination of PACP and MACP will enhance training and certification of Users
- Addition of MACP data with PACP Standard Database will improve use of manhole inspection data
- Standardization of manhole assessment will improve the understanding of manhole defects and facility more straight-forward, consistent, high quality manhole rehabilitation



More Information?

Irv Gemora

director@nassco.org

(410) 486-3500