



**don't crack under pressure**

# **Advantages of high quality PE pipe materials**

## **Turkey Seminar - April 3, 2003**

**by Robin Bresser / PE100+ Association**



## Creating value in Pipe - basic human needs

- Water supply
- Energy supply (gas, oil, hot water)
- Sewage disposal
- Telecom



Roman times . . .



. . . and today

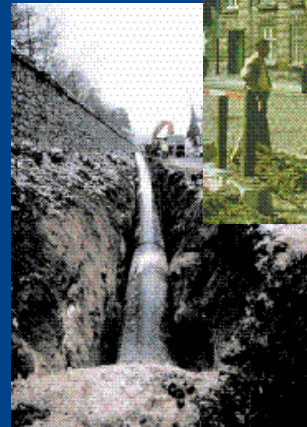
## In Europe, PE&PP pipes have an impressive track record

- 1950's - first PE pressure pipe installed
- 1970's - second generation PE for water and gas
  - crosslinked PE (PEX) for hot water
- 1980's - PP pipe systems for new applications
- 1990's - bimodal PE100 introduced
  - higher pressures and larger pipes
  - PO pipe markets grow at 6%
- 2000 - high momentum into the new millennium



## Key success factor for PE pipes: Flexibility

- Long lengths in coils
- Curving trenches
- Modern installation techniques
  - relining
  - horizontal drilling
  - plowing in



## Key success factor for PE pipes: Weldability

- Cost effective butt welding
- Safe and practical electrofusion
  - earthquakes
  - ground movement
  - tree roots



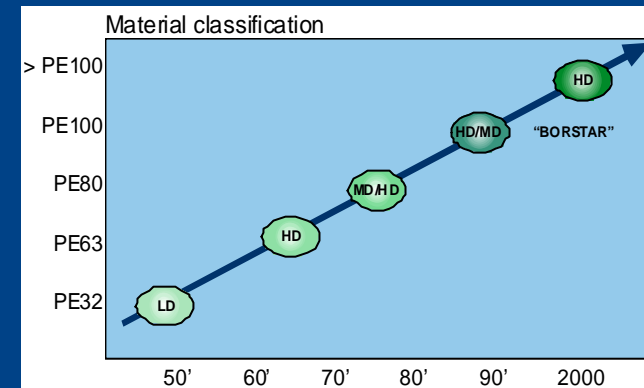
## Key success factor for PE pipes: Water neutrality

- No corrosion
- Neutral towards drinking water
- No encrustation
- Low coefficient of friction

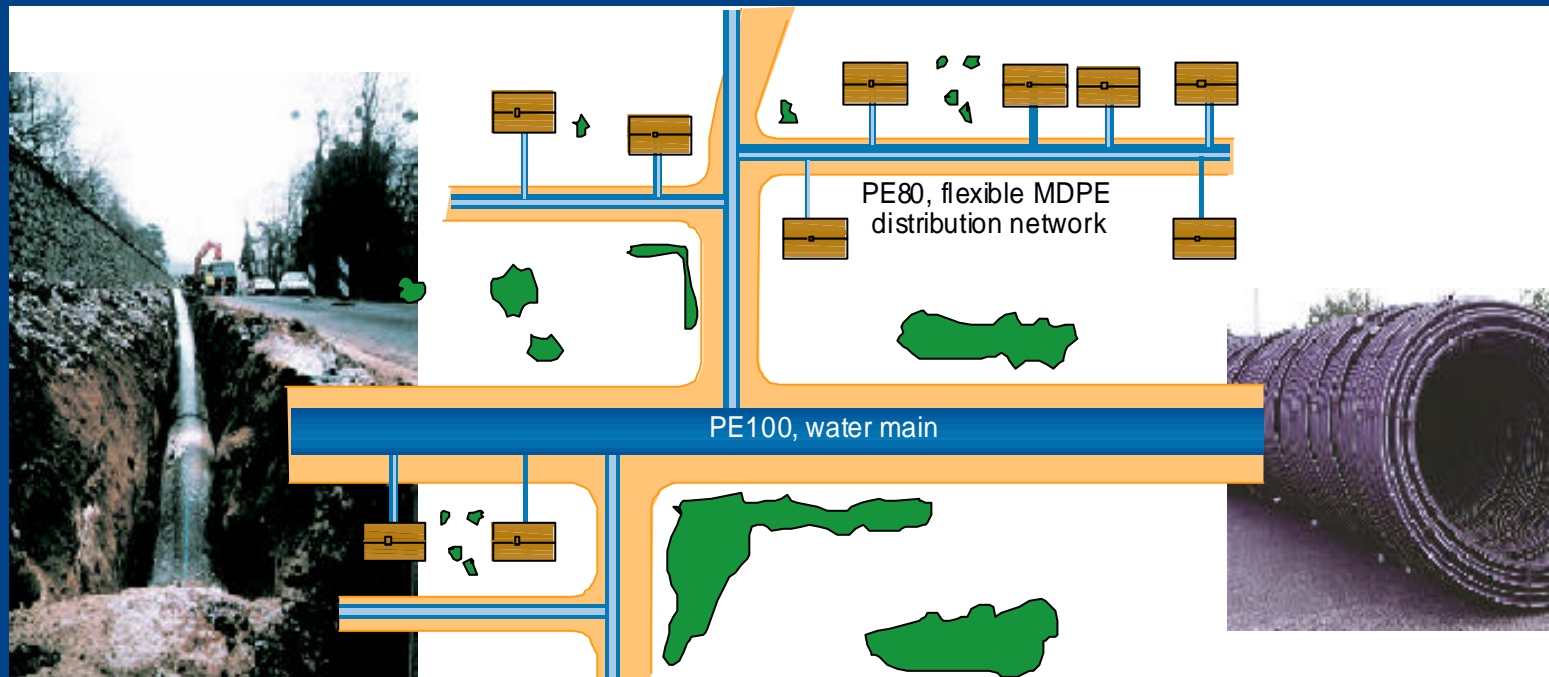


## Key success factor for PE pipes: Positive image

- Innovation / new generations
- High level of standards
- Safe for gas transportation
- Environmentally friendly
- 100 year lifetime for bimodal, ready made compounds

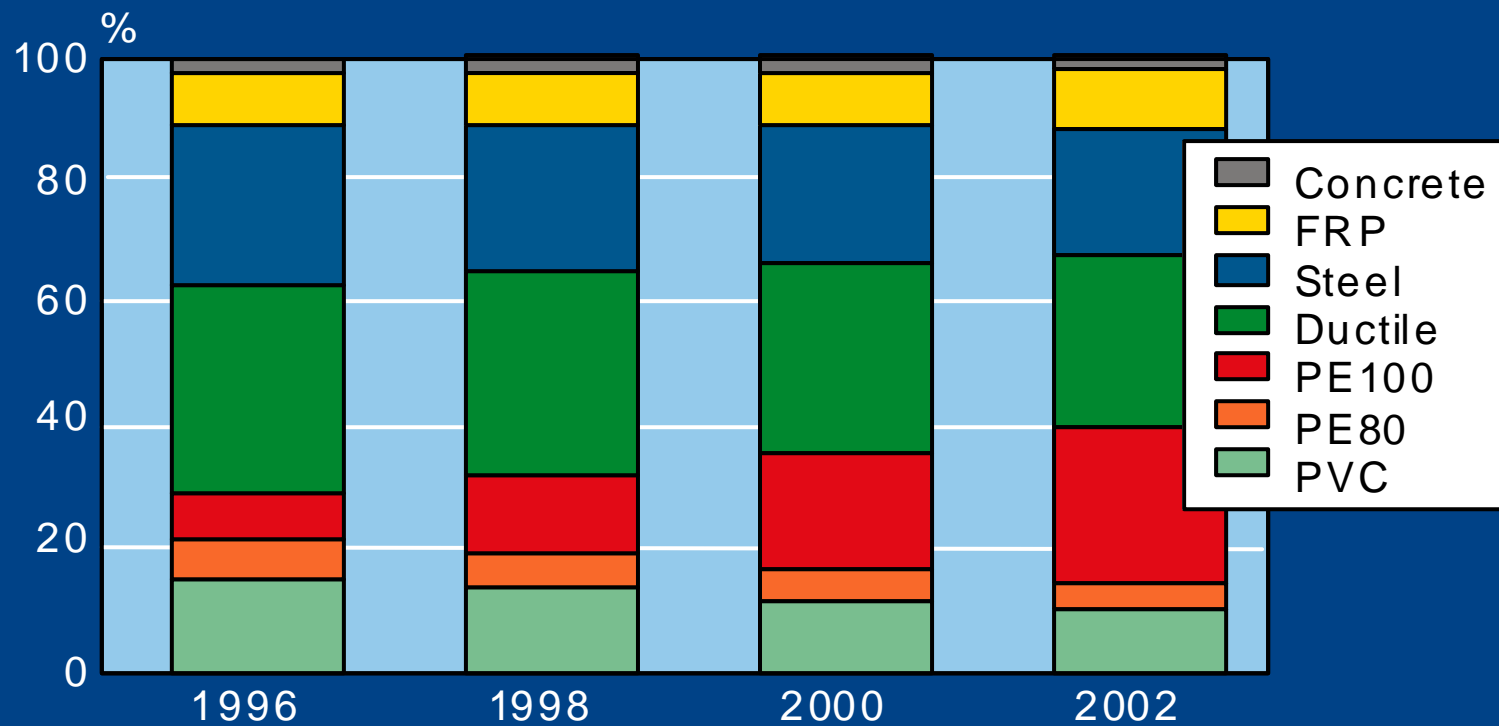


## Water distribution mains and service pipes





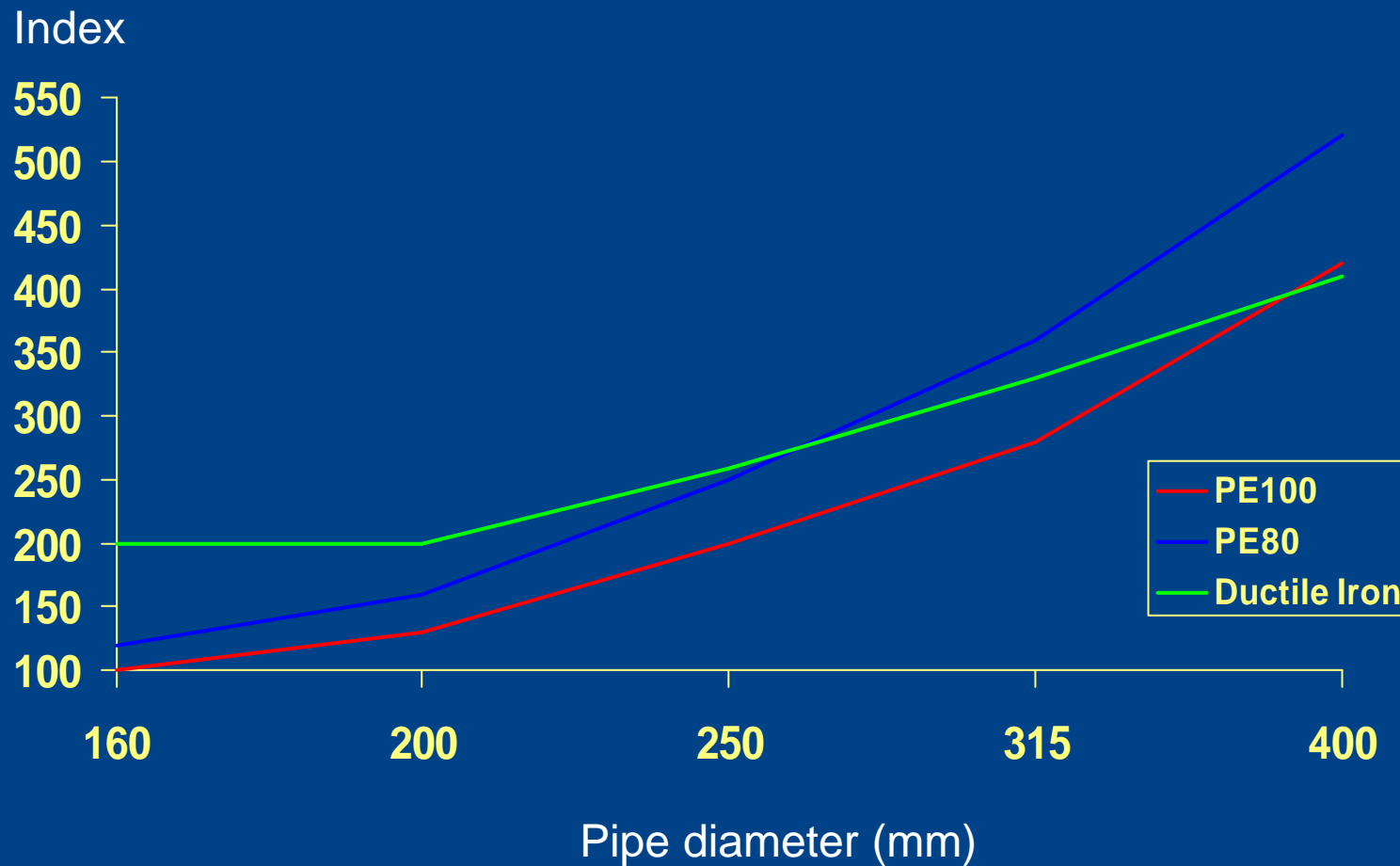
# Water pipe mains >180mm - material trends Germany



Strong PE penetration is foreseen in the diameters above 180 mm

Sources: CDC 1999

## Estimated installation cost for water pipe ( 10 bar network in UK)



## Earthquake pipe failure statistics: Armenia, Colombia

Material	Installation Length (km)	Failures per km
PVC (water)	99,95	0,80
Ductile iron (water)	5,69	0,00
Asbestos cement (water)	221,9	0.95
Steel reinforced concrete (water)	1,14	0.00
Galvanised steel (water)	3,81	0,52
Cast iron (water)	1,03	0,97
Polyethylene (gas)	115,13	0.00

**Sources:** EPA Colombia, March 1999 and Gases del Quindio E.S.P. Colombia, 1999

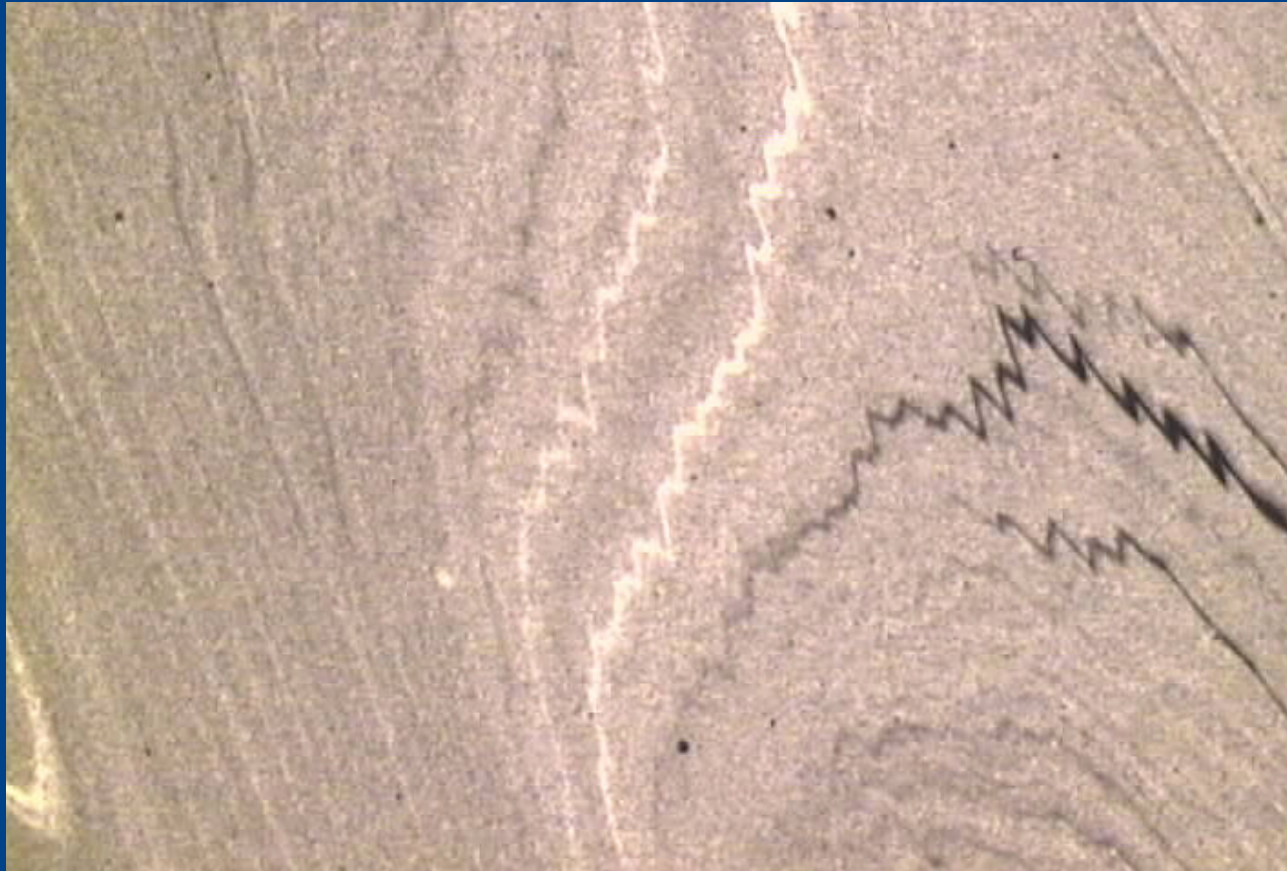
## Balance of mechanical properties

Long Term Hydrostatic Strength (MRS)

Slow Crack  
Growth (SCG)

Rapid Crack  
Propagation (RCP)

## Dispersion of additives



Microscope photo  
of pipe made of  
natural resin and  
master batch  
(100X magnification)

# Drinking water quality



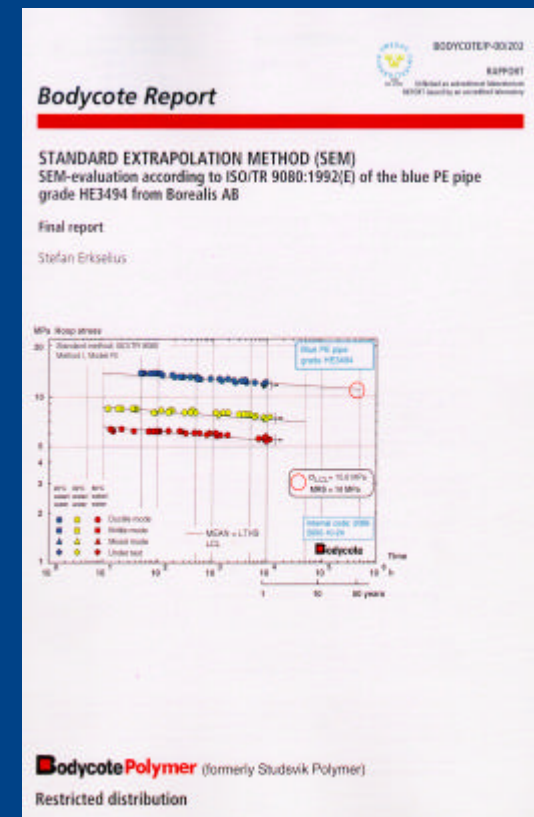
Rigorous organoleptic testing of pipes and granules

## Test on real pipe systems to confirm quality



## Minimum safety factor of 1,25 for water allowed because:

- Experience with extrapolation methods
- Documented, ready made compounds
- Combination of tests done on pipe and compounds
- System standards (Type test, PVT, BRT)
- Positive track record





## Australia case: quality pipes for long lifetimes



## Hammersley water transportation project, Australia: project requirements

- Supply of water to a large, remote iron borefield
- Water requirements of 200 l/s
- 60 km of 500 mm pipeline (3000 tons of PE100 material)
- Very stony, uneven and hot terrain
- Corrosive soil and alkaline water
- 20 years service life with low maintenance



## Hammersley water transportation project, Australia: cost effective installation



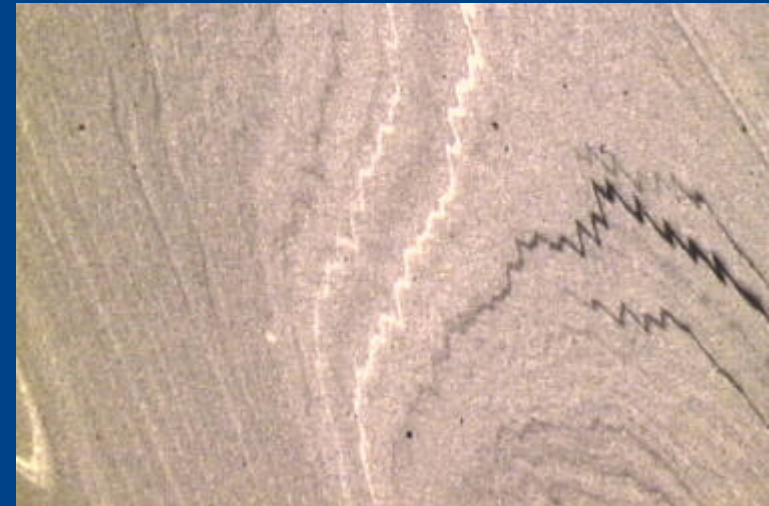
## Hammersley water transportation project, Australia: trouble free operation

- Pipeline has been in operation since 1995
- Very few maintenance stops  
repair minor welding problems
- No problems with the pipe material  
steel pipeline estimated lifetime: 6 months
- Hammersley is generally happy with  
their choice of pipe material

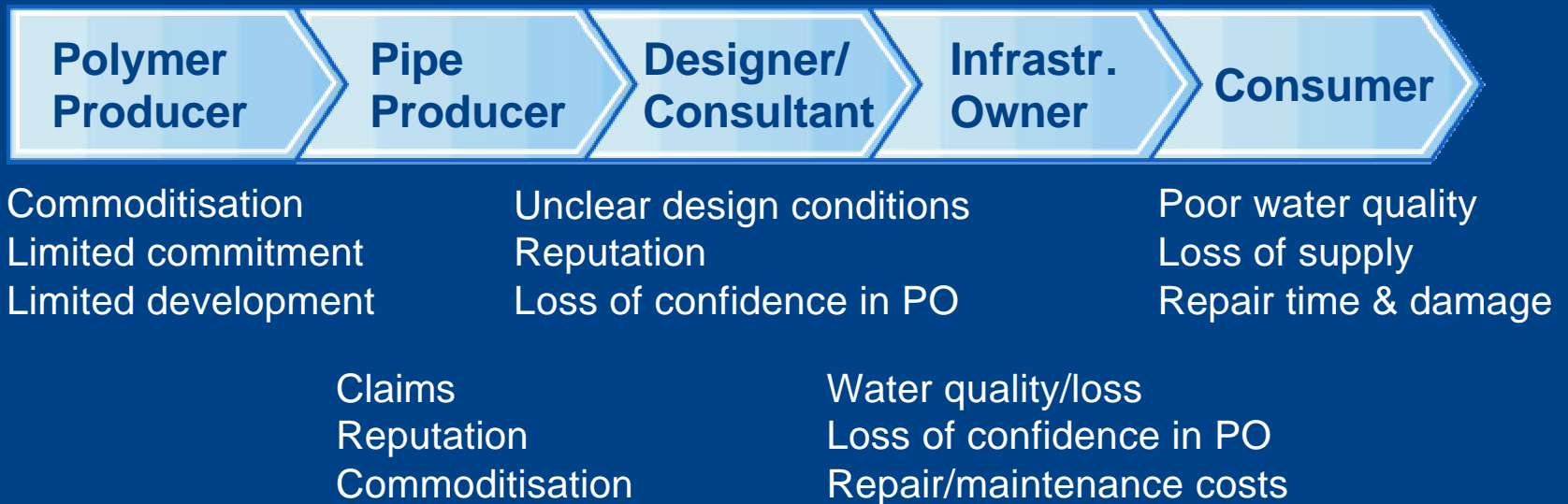


## Case Story: Indian PE pipe history and relaunch

- HDPE pipes introduced in 1969 followed by decade of steady growth to 35 ktons
- Poor quality pipes in market
  - poor uv stabilisation
  - unsuitable master batch
  - no technical support
- Brittle failures resulted in loss of confidence, AP province ban in 1982 and stagnation
- Two high profile PO pipe seminars in November 2000
  - Mumbai
  - Hyderabad (AP province)
- Establishment of Indian Polyolefin Pipe Association in progress



## Weak or poorly enforced raw material standards: everybody loses



## Conclusion and outlook for the future

- PE water pipe systems have had very strong growth and an impressive track record
- High level of standards and approvals are critical to sustain this growth
- PE pipe industry will remain strongly committed to the water segment