



**don't crack under pressure**

# **High demands require high quality PE compounds**

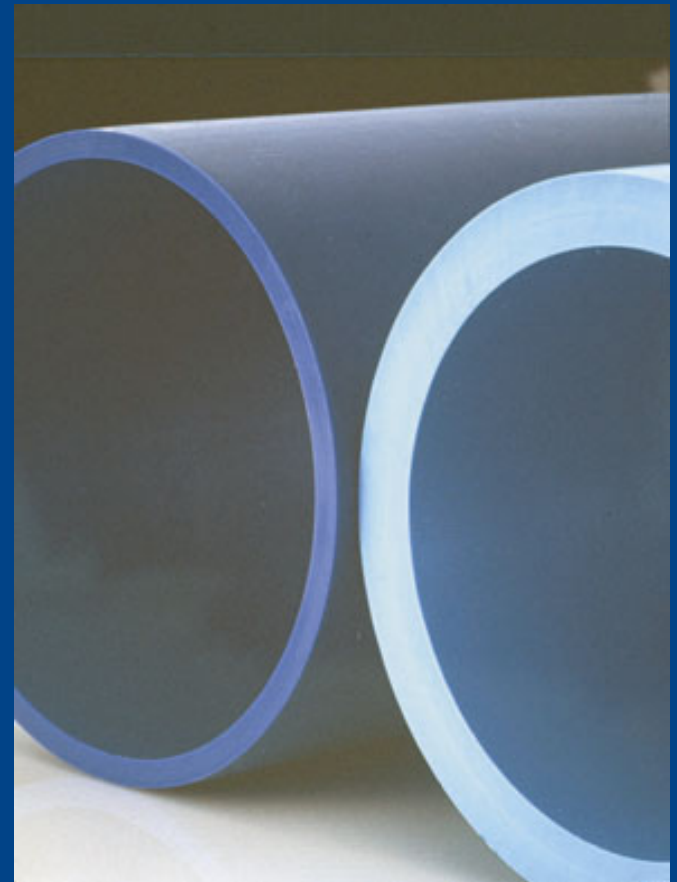
## **Turkey Seminar - April 3, 2003**

**by Huseyin Bak / Dave Walton, Borealis**



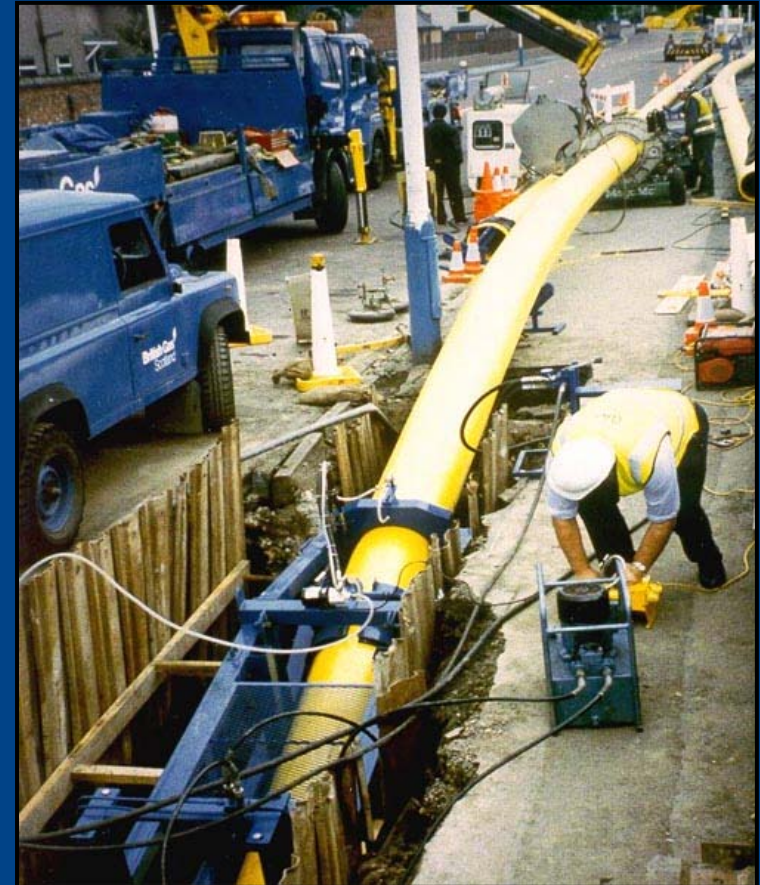
# High Demands Require High Quality PE Compounds

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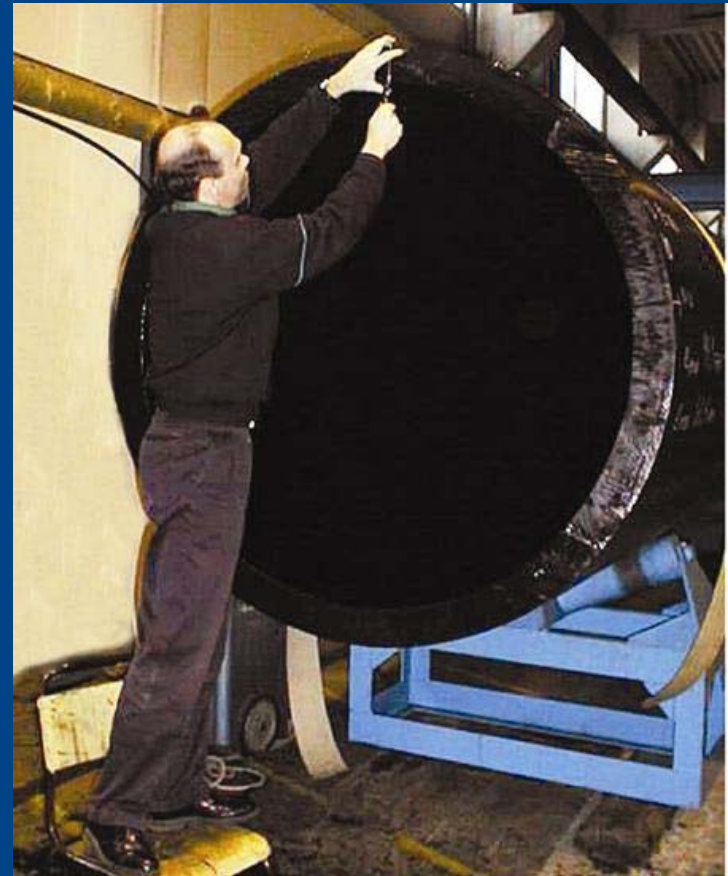
# The High Demands on PE Gas & Water Pipe Materials

- The full cost benefits from PE pipes comes for installation savings due to the flexibility and fusion capabilities of PE.
- High on the benefit list is the ability to use a range of No-Dig methods to renovate old gas and water mains.
- These techniques impart external damage to the pipe which must not develop into cracks.



# The High Demands on PE Gas & Water Pipe

- PE pipes are also getting larger in diameter and thicker walled - demanding higher toughness from the PE raw materials
- Today, PE pipes are also used at higher pressures and with a lower design factor demanding greater consistency of performance.
- These demands can only be met by high quality “ready made” raw material compounds.





# Pipe Material Performance Matches Today's Demands

- As demonstrated in a number of the papers the performance of the raw materials has increased to cope with these higher demands
- Long term strength has increased to provide greater competitiveness against other pipe materials
- Crack growth resistance has increased dramatically safeguarding against failures from surface defects and improving reliability



# Pipe Material Performance Matches Today's Demands

- Product consistency has increased allowing these lower design factors to be safely implemented
- This level of quality and consistency cannot be achieved by blending natural polymer and additive masterbatch on the extruder but only by using high quality “ready made” compounds.



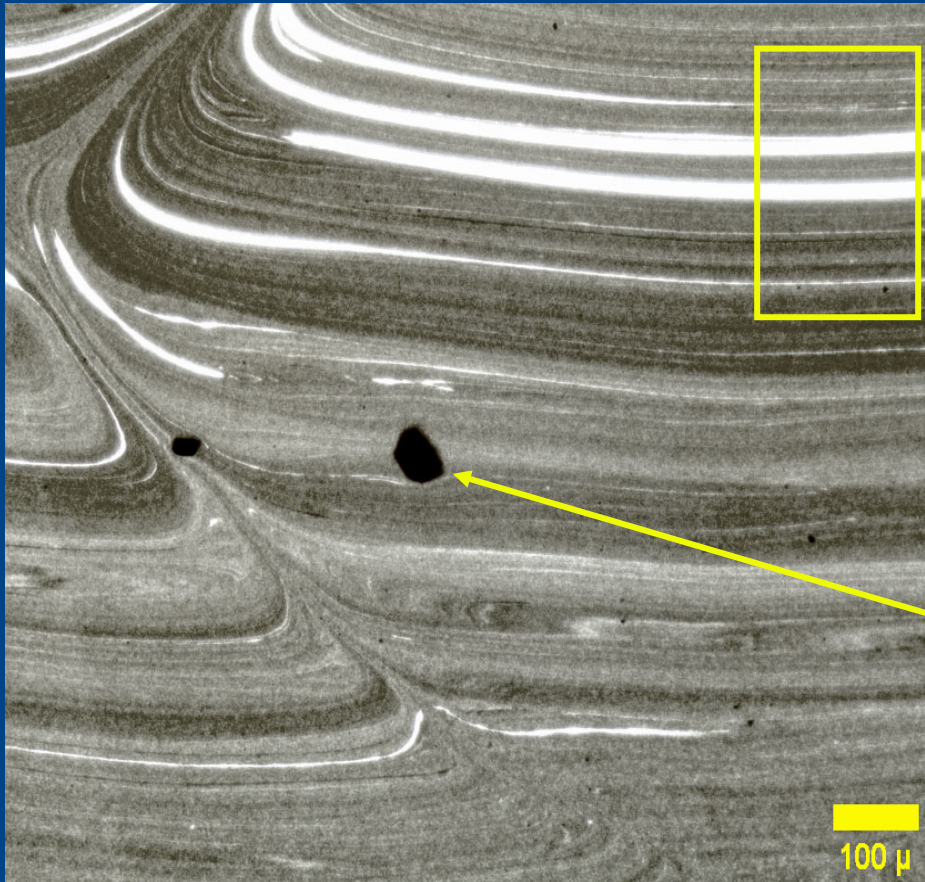
# The Need for High Quality “Ready Made” PE Compounds

- PE pipes are replacing products that have performed well over a long period and must achieve similar targets
- Good dispersion of pigments & additives is essential to achieve long term reliability
- “Ready made” compounds are tested by the raw material supplier over a long period of time to demonstrate compliance with the MRS value





# Poor Dispersion and Distribution of CB in a Pipe Wall



## Poor distribution

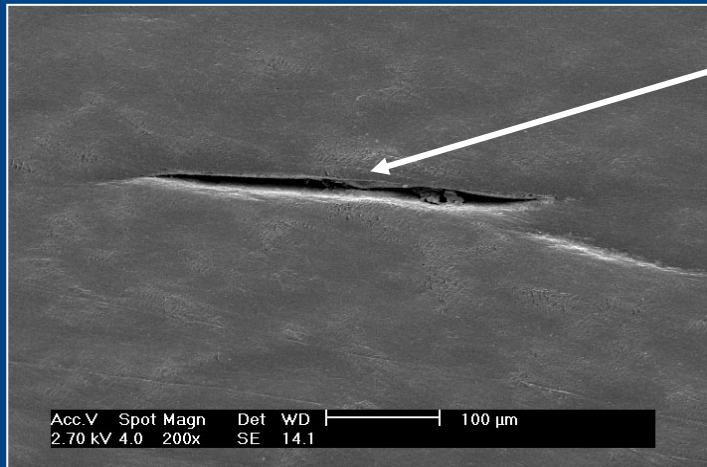
- Poor mixing in extruder
- Wrong master batch carrier material

## Poor dispersion

- Low quality master batch

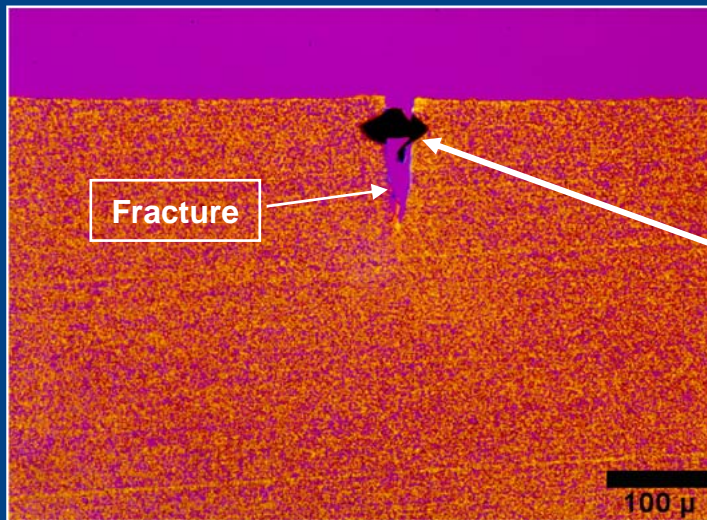


# Crack Starting at a Pigment Agglomeration in a Pressure Pipe

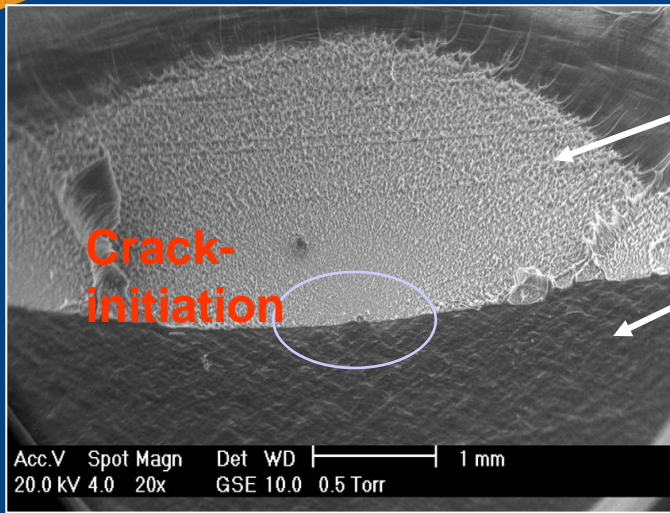


## Reason for failure

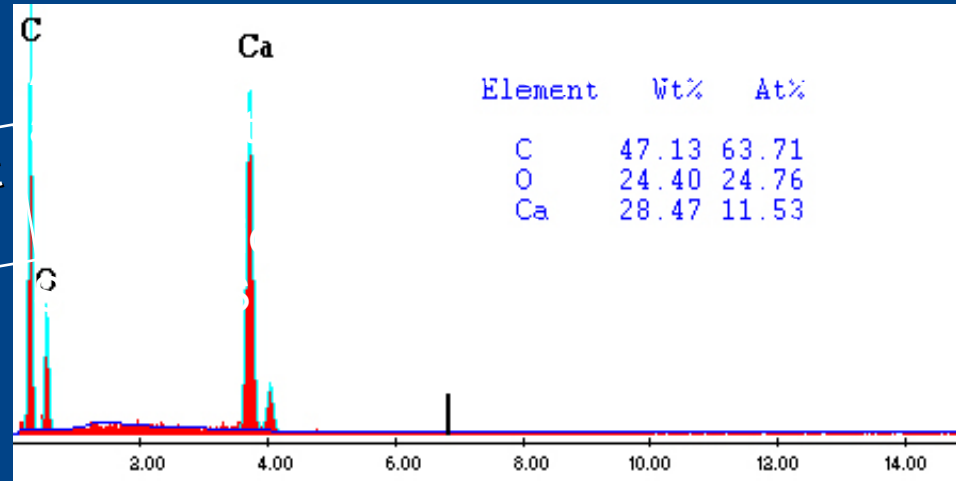
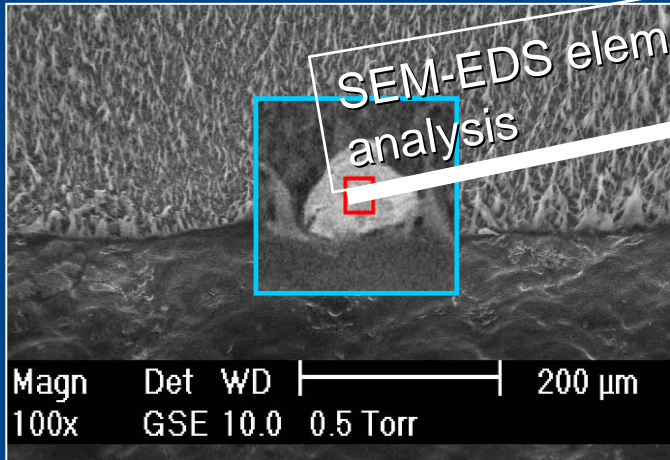
- Colouring with low quality master batch (pigment agglomeration) will act like foreign particles causing premature failures



# Investigation of Fracture Surface (Pipe)



Fracture surface. The starting point of the crack is easily seen at a macroscopic level.



Conclusion:  
The crack is initiated by a Calcium carbonate particle.

# The New European Standards for PE Gas & Water Pipe

- The new European Standards prEN 1555 & prEN 12201 have just been approved by EU countries
- These standards reflect these new levels of pipe performance
- These standards also **specify** the use of “ready made” compounds for water & gas pipes

