EPRG

More than 40 years in Pipeline Research

UKOPA – EPRG meeting
BP - Sunbury - 18 November 2015

Gerhard Knauf
Secretary General EPRG

EPRG

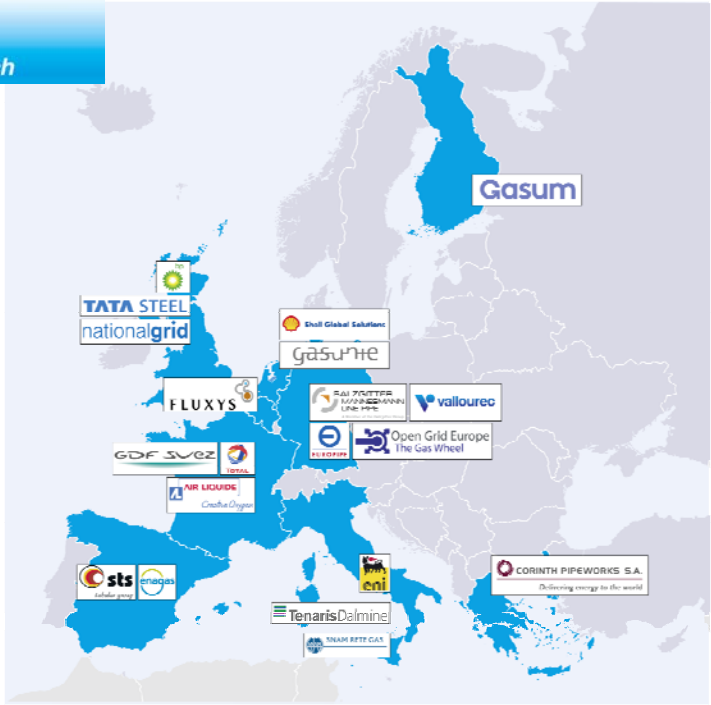
> 40 Years in Pipeline Research

13 Gas Transmission Companies

7 Pipe Manufacturing Companies

European based, representing

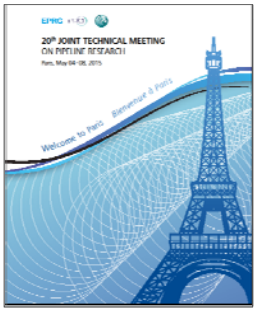
- **> 100,000 km high pressure gas transmission lines**
- **> 2,000,000 tons/year line pipe production capacity**

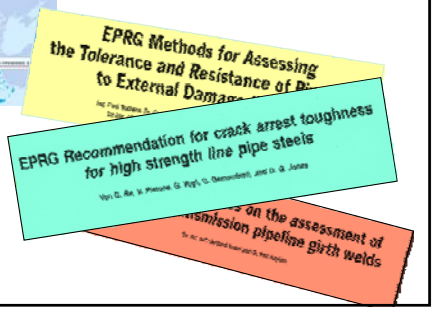


Outline

EPRG
EUROPEAN PIPELINE RESEARCH GROUP

- The Beginning
  Background and intentions
- Europe meets America and Australia
  The Joint Technical Meetings
- Organisation and Mission
  Motivation and Drivers
- Topics – Results
  Reports, recommendations, guidelines





The Beginning

EPRG
EUROPEAN PIPELINE RESEARCH GROUP

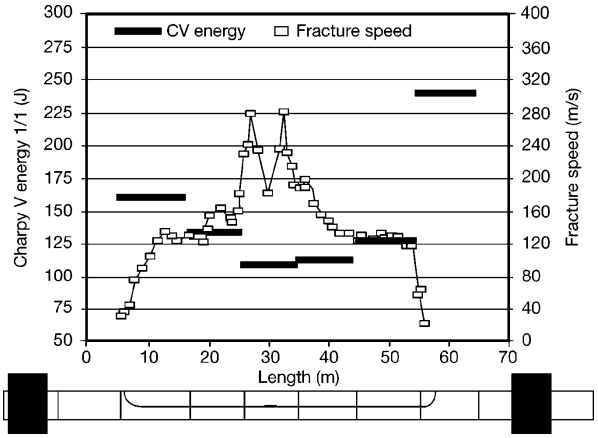
- **Long distance gas pipelines for more than 120 years**
  - **1891** **Indiana – Chicago (120 miles)**
  - **1950/60** **Pipeline networks in US and Europe**
  - **1973** **USSR – Western Europe (long distance pipeline, 1800 km)**
- **From 1960s:**
  US reports on long running fractures in gas pipelines

- **1972 Foundation of EPRG**
  - **European Pipe Manufactures**
  - **European Gas Transmission Companies**

Preliminary name: **EGILRFGTL**
European Group for investigation of long running fracture in gas transmission lines

Ductile fracture arrest

- **> 20 EPRG sponsored full scale tests**
  - **up to X100, Ø 1420 mm, wt 25 mm**
  - **investigate effect of diameter, wall thickness , hoop stress**



- **EPRG full scale tests were carried out by British Gas (today DNV-GL), UK and CSM, Italy**

EPRG – more than 40 years in pipeline research

Toughness requirement in ISO 3183 / API 1104

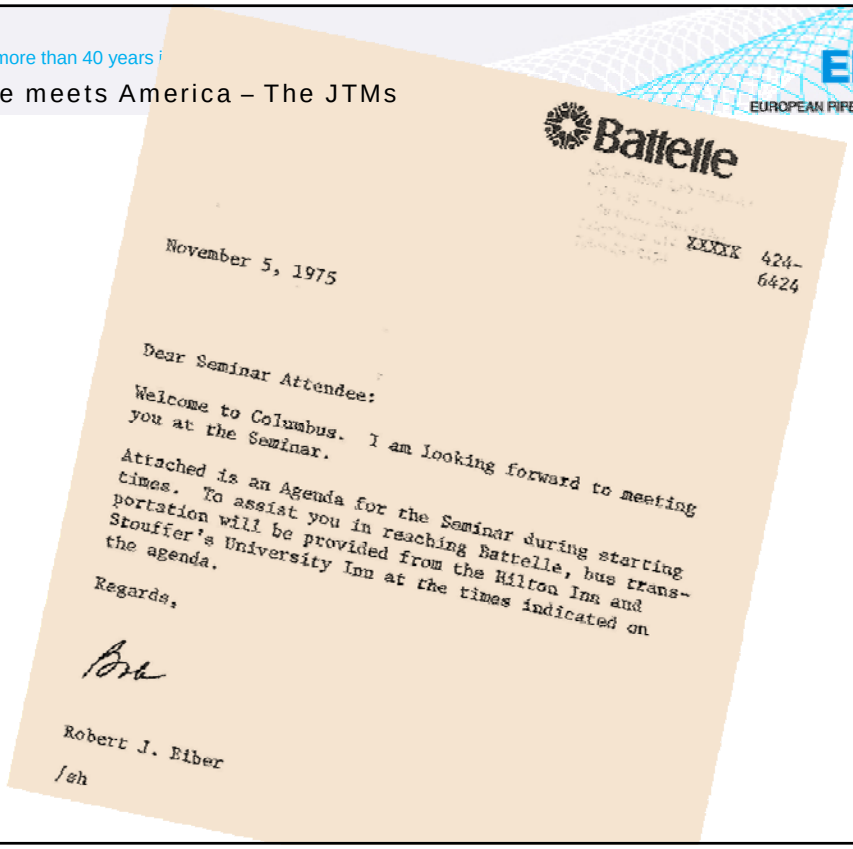
CVN impact energy required to arrest ductile failure in gas transmission pipelines operating with a safety factor of 1.6 (= design factor 62.5%)

Grade	Pipe outside diameter (mm)								
		> 510	> 610	> 720	> 820	> 920	> 1020	> 1120	
	≤ 510	≤ 610	≤ 720	≤ 820	≤ 920	≤ 1020	≤ 1120	≤ 1220	≤ 1430
L 240	40			40					40
L 290									
L 360									42
L 415									
L 445					40		42	43	47
L 480	40	41	45	48	51	53	56	58	63
L 550	48	55	61	66	72	77	82	87	96

CVN impact energy required to arrest ductile failure in gas transmission pipelines operating with a safety factor of 1.4 (= design factor 71.4%)

Grade	Pipe outside diameter (mm)								
		> 510	> 610	> 720	> 820	> 920	> 1020	> 1120	
	≤ 510	≤ 610	≤ 720	≤ 820	≤ 920	≤ 1020	≤ 1120	≤ 1220	≤ 1430
L 240	40			40					40
L 290									42
L 360									
L 415				40	41	44	46	48	51
L 445	40	40	41	43	46	48	51	53	57
L 480	46	50	55	58	62	65	68	71	77
L 550	61	68	76	83	90	96	102	108	120

Europe meets America – The JTMs



Battelle

November 5, 1975

XXXX 424-6424

Dear Seminar Attendee:

Welcome to Columbus. I am looking forward to meeting you at the Seminar.

Attached is an Agenda for the Seminar during starting times. To assist you in reaching Battelle, bus transportation will be provided from the Hilton Inn and Stouffer's University Inn at the times indicated on the agenda.

Regards,

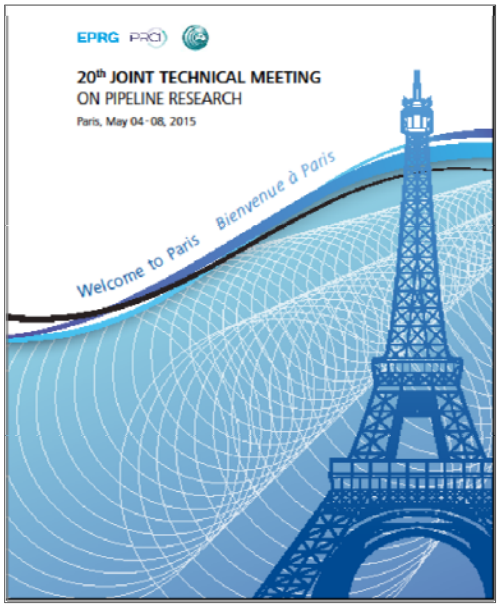
Robert J. Biber

/sh

The Joint Technical Meetings

20 Joint Technical Meetings on Pipeline Research

1975	Columbus, USA
1976	Amsterdam, Netherlands
1978	Houston, USA
1981	Duisburg, Germany
1983	San Francisco, USA
1985	Genoa, Italy
1988	Calgary, Canada
1991	Paris, France
1993	Houston, USA
1995	Cambridge, Great Britain
1997	Washington, USA
1999	Groningen, Netherlands
2001	New Orleans, USA
2003	Berlin, Germany
2005	Orlando, USA
2007	Canberra, Australia
2009	Milan, Italy
2011	San Francisco, USA
2013	Sydney, Australia
2015	Paris
2017	Colorado Springs, USA



EPRG – more than 40 years in pipeline research

Members and Organisation

Multinational / Multicultural

Challenge - Experience - Enrichment

EPRG – more than 40 years in pipeline research

EPRG committee structure

Plenary Group

Chairs:
Gerhard Knauf - SZMF
Paul Roovers - FLUXYS

Corrosion

Chair:
Janne Lumme – GASUM

Coming Chair:
Hervé Marchebois - TOTAL

Materials

Chair:
Tanja Schmidt - VALLOUREC

Design

Chair:
Luca Bacchi - SNAM RETEGAS

EPRG committee structure

EPRG
EUROPEAN PIPELINE RESEARCH GROUP

Plenary Group

- Steering committee
- Road map
- Budget allocation
- Budget control

Corrosion

- HIC
- SSC
- External damage & corrosion
- Coating

Materials

- **Fracture behavior**
  high strength steels,
  high pressure,
  various fluids
- Material properties
- Test conditions

Design

- External damage
- Ground movement
- Girth weld defects

EPRG – more than 40 years in pipeline research

EPRG – Mission

EPRG
EUROPEAN PIPELINE RESEARCH GROUP

Use the combined expertise of gas transmission and pipe manufacturing Companies

Address common issues concerning the technical integrity of gas transmission pipelines in the fields of

- **pipe manufacturing,**
- **pipeline design,**
- **construction,**
- **operation and maintenance.**

Projects (1)

- **Time dependent failure of damaged pipelines**
  analysis and testing to investigate time dependent failure in modern high toughness steels and recommend pressure reductions when excavating damage
- **Assessment of wrinkle bends**
  full scale cyclic pressure testing of cold field bends with wrinkles to support acceptance limits
- **Mobile optical emission spectroscopy**
  review of methods and experience using OES to check composition of fittings
- **Corrosion in girth welds of vintage pipe**
  review of test data to produce recommendations for tolerable depths of corrosion in low toughness girth welds
- **Environmental effects on mechanical damage**
  full scale cyclic pressure tests on pipe sections with mechanical damage in simulated ground water environment with and without CP
- **Discrimination of repaired pipe mill features by ILI**
  review of detection of pipe mill features and discrimination from in-service damage

EPRG – more than 40 years in pipeline research

Projects (2)

- **Inverse fracture in DWTT**
  full scale crack propagation tests of pipe showing inverse fracture
- **System effects in West Jefferson tests**
  can WJ test be used to investigate brittle fracture propagation for small diameter thick walled seamless pipe
- **Monitoring of buried gas pipelines subject to ground movement** –
  review of techniques
- **Low bond line toughness in HFW pipe**
  development of test method to identify low toughness and burst tests to develop assessment methods
- **Long term adhesion loss in 3 layer PE / PP coatings**
- **Fracture control and corrosion in pipelines transporting anthropogenic CO_2**
- **Dent – gouge model**
  development and validation of an improved model for dent-gouge damage

External contacts / Co-operations

- **Member of the Tripartite Group (EPRG-PRCI-APGA)**
  - Joint working groups, jointly funded projects, JTMs
- **Cooperation with DNV**
  - Jointly funding SARCO2 – (EC funded project)
- **Contacts with HLP**
  - Meetings of working groups on fracture and corrosion
- **Work for API, ISO, DNV, PDAM**

  Studies and reports to support standardisation, guidelines

EPRG

More than 40 years in Pipeline Research

UKOPA – EPRG meeting
BP - Sunbury - 18 November 2015

Gerhard Knauf
Secretary General EPRG