# eon Ruhrgas marcogaz

<u>UNECE –</u> International Conference on Risk Assessment and Management

## R&D Activities as Driver of Efficient Pipeline Integrity Assessment

Dr. Bernd Groh

24 – 25 November 2009 Salle XII, Palais des Nations, Geneva





## Content

- 1. Today's challenges
- 2. Legal framework
- 3. Quality control
- 4. Safety approach
- 5. Protection measures
- 6. Pipeline integrity
- 7. Statistics
- 8. Innovation





The European gas industry faces tremendous geopolitical and economic challenges.

- A reliable and safe gas supply is essential for modern societies.
- The European Commission expects the EU's dependence on gas imports to increase from about 57% today to 84% within the next 20 years.
- In this context, efficient integrity management focusing on modern technical developments is of key relevance to the industry.
- High priority for the gas industry: Bringing together technical safety and economic efficiency in the framework of risk assessment and simultaneously promoting technical innovations.

## *e-on* Ruhrgas

## marcogaz

## European Natural Gas Transmission network.

Pipelines / LNG-Terminals:
In Place (14)
In Progress (5) (6)
Network length: 222.548 km
Compressor stations: 154
Underground storages: 107
Cross-border points: 107

Sines







## Safety management is laid down in legislation







## Safety methodology is based on quality assurance



 $Planning \longrightarrow Design \longrightarrow Construction \longrightarrow Operation \longrightarrow Maintenance$ 





marcogaz

An integral concept builds the basis to an efficient safety management.

Two approaches to assess technical safety ...

#### # Deterministic safety concept

• Analysis of causes:

The deterministic approach encloses the definition of safety measures which are based on **causal relations** which determine threats or incidents to pipelines.

 Based on existing guidelines and experiences of many years

#### # Risk-based safety concept

Identify a risk area



 Individual risk levels are used to decide on safety measures and on safety distances (prevention)





## Characteristics ...

#### # Risk-based concept ....

- Possible consequences are limited to a defined technically worst case scenario
- Individual risk is defined as the likelihood of an individual being exposed to a specified level of harm for example receiving a dangerous dose of a toxic substance or heat or being subjected to blast overpressure (UK).
- **Societal risk** take into account of different demographic density and distributions. The societal risk is used to decide on measures in case of an accident.
- It is a common legal duty in European countries to demonstrate that risks are as low as reasonably practical (ALARP):







## What is an acceptable risk ?

Risk	=	Probability	*	Consequence
Risk	=	P <sub>Ignition</sub> * P <sub>Ru</sub>	pture	* Consequence
2.8*10 <sup>-8</sup>	=	0,048 * 6*1	0-7	* 1 Victim

#### **Technical generic risk < natural risk**



#### Likelihood of death by lightning is 35 times higher (10<sup>-6</sup>).





## Characteristics ...

#### <u># Deterministic concept ...</u>

- In the frame of the deterministic safety concept decision are taken based on the used technology, not on the calculated and associated risk.
- The deterministic concept is based on the precautionary principle. The deterministic and the probabilistic concept comprises so called primary safety measures to reduce the probability of any damage which might occur.
- Furthermore so called secondary safety measures are determined to minimise any consequences

# **e-on** Ruhrgas





# *C-01* Ruhrgas



## Pipeline Integrity is based on proved standards: PIMS

- Objective: Smooth handling of all work done during normal operation and in exceptional operating conditions.
- A major part related to this development was covered by the CEN/TC 234 committee work started in 1990.
- E.ON Ruhrgas, a German TSO, introduced workflows reducing the risk of system failures by laying down rules on which organizational or technical measures are to be taken to establish a continuous asset assessment process.













## EGIG incident database: a proven safety record

- EGIG database: Gather data on the unintentional releases of gas in pipeline transmission systems.
- EGIG involves 15 major gas transmission system operators in Western Europe.







## Innovation is a mainstay to reliability ...

... rising energy costs and increasingly stringent environmental requirements call for the development and use of new technologies. Therefore industry has always shown interests to develop new methods.

Some of these new projects under development in the gas industry are related to:

- Acoustic methods
- <u>Electric methods</u>; uses the existing measuring points of cathodic protection systems to detect a "short circuit" caused by an excavator, drilling equipment or a trench cutter etc. coming into metallic contact with the pipeline.
- Spectral methods;
  - → with laser systems (CHARM<sup>®</sup>)
  - → based on infrared spectroscopy (Gas Camera)



marcogaz

Gas Camera – small traces of methane at process plants to be detected quickly and reliably

- The Gas Camera was mainly developed at Hamburg University of Technology on behalf of industry with support by E.ON Ruhrgas, Gasunie, Fluxys and Snam Rete Gas.
- The Gas Camera is a remote detection system that provides video images of gas clouds displayed of the target (leak).
- It analyses infrared radiation that propagates from the background of the field of view through the gas cloud to the optical receiver and the sensing element.
- It is capable of safely detecting gas clouds with column densities as low as 150 ppm·m.



#### Benefit:

- Proof of save operation or identificatio of explosion zones
- Fast und efficient leak detection





Thank you for your attention.





Backup





CHARM<sup>®</sup> – <u>CH<sub>4</sub> Air Remote Monitoring</u>, i.e. helicopterborne infrared laser-based remote gas detection system



DI ARES

ADVANCED LASER REMOTE SENSORS

Technical development for single

point (local) gas detection systems

in Unternehmen von @.on





## **CHARM**<sup>®</sup>

#### Main technical features:

- Based on the differential absorption measurement principle (LIDAR)
- Gas clouds arte detected by tuning the laser wavelength to the spectral signature and absorption characteristics of the gas
- Gas concentrations can be determined over a width of at least 7 metres up to 12 metres
- Even the slightest traces of natural gas can be identified during routine air patrols at a speed between 50 – 90 km/h
- The operational detection limit is less then 25 ppm·m at a high detection resolution.







