

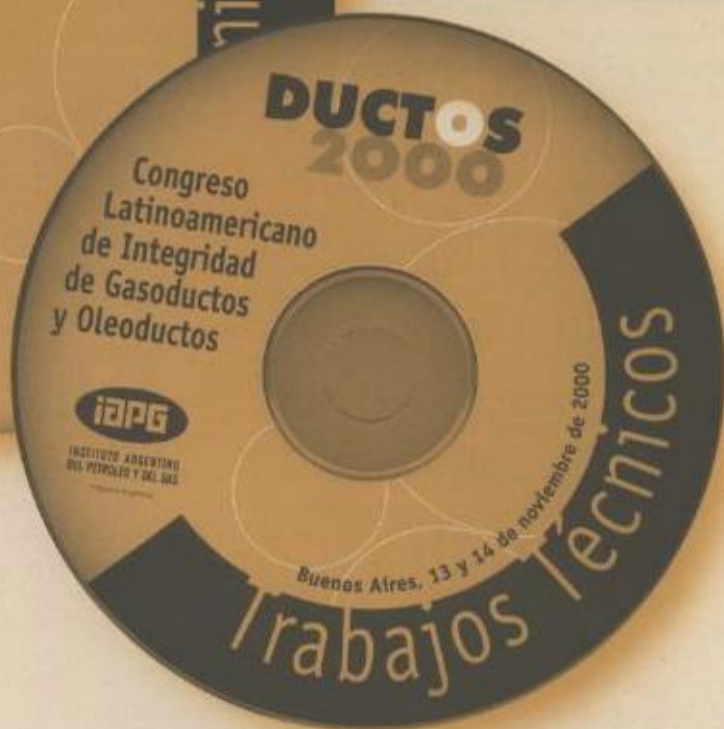
Ductos 2000: Trabajos Técnicos

**DUCTOS
2000**

**Congreso
Latinoamericano
de Integridad
de Gasoductos
y Oleoductos**

Buenos Aires, 13 y 14 de noviembre de 2000

La versión completa de cada uno de estos 9 Trabajos Técnicos podrá ser consultada en Biblioteca o en la página Web del IAPG: www.iapg.org.ar



En noviembre del año pasado tuvo lugar el Congreso Latinoamericano de Integridad de Gasoductos y Oleoductos "Ductos 2000" que se realizó en Buenos Aires organizado por el IAPG.

Durante el mismo se presentaron 24 trabajos técnicos, de los cuales hoy publicamos los resúmenes de 9 de ellos.

1) Total Pipeline Integrity

Por Dave G. Jones, PII Group Ltd., UK. Patrocinado por PII

An operator needs to maintain a safe pipeline, and to ensure it has a long and profitable life. Consequently, he must consider integrity strategies that are both cost effective and prevent failures or large repair bills.

These considerations are against a background of the move world-wide to replace the prescriptive framework for pipelines by a modern goal-setting regime. In particular, operators are required to provide a case demonstrating that they have reduced the risks arising from operation of a pipeline to a level "as low as reasonably practicable".

This paper presents case studies of providing solutions to pipeline integrity issues including:

- Increasing planned pre-service hydrotest level
- Defect assessment
- Maintenance and rehabilitation
- Risk Based Inspection
- Extending the life of corroding pipelines
- Reducing risk to public
- Upgrading pipelines
- Life extension of pipeline systems

2) Reliability based design for pipeline construction and operation

Por Valentino Pistone, Paola Bonandrin, Snam S.p.A. Italy. Patrocinado por Camuzzi Gas

Risk assessment, risk based inspection, and similar words are nowadays widely used in plant and pipeline operation, but they have widely different meanings. On one side qualitative models to support priority decisions for pipelines maintenance are

widely used, at the opposite extreme very seldom applied are quantitative analysis as a basis for negotiation with Authorities.

Within this context the paper will elaborate on the use of quantitative models for fracture probability calculation as tool for rational design and maintenance choices. Special problems, like earthquake or landslides, very severe environments, like pipeline construction in operation in Arctic regions make traditional design against internal pressure via safety factor choice rather inadequate. Reliability analysis is an appealing tool to account in a quantitative way for the different failure modes relevant to pipelines in different environments.

3) Protección catódica de las estructuras enterradas en plantas de bombeo,

compresoras, tratamiento y proceso en la industria del gas y del petróleo

Por Walter Müller, MetroGas SA y Ricardo Dovico y Rafael Crouzeilles, ARCAN Ing&Const

La protección de plantas ha sido y continúa siendo motivo de controversia en el plano internacional contando con opiniones divididas entre quienes consideran que el sobredimensionamiento de los espesores de pared de las estructuras de acero enterradas es suficiente como para alcanzar la vida útil pretendida, aquellos que recurren a la selección de materiales resistentes a los distintos tipos de ataque presentes y quienes recurren a la protección catódica como método eficaz y reconocido.

El presente trabajo trata este último criterio considerando y comparando distintos casos en los que se cuente o no con sistemas de aislación dieléctrica de forma de separar las instalaciones de superficie de las enterradas, incursionando incluso en el aspecto económico, el cual es, en definitiva, el motivo de fondo de toda discusión entre los distintos criterios arriba citados.

Se describen casos prácticos extraídos de la experiencia de los autores, en los que se aprecian las distintas posibilidades de protección con el fin de propender a la extensión de la vida útil e integridad de las instalaciones enterradas.

4) Comparisea of corrosion estimates from a growth model 5 years after the previous inspection

Por Robert Worthingham, TransCanada y Tom Morrison y Guy Desjardins, Morrison Sci Canada. Patrocinado por Transportadora de Gas del Norte S.A.

A methodology has been developed over the past decade that, from repeated inspections of a pipeline using an in-line inspection tool, enables the transmission operator to estimate growth of corrosion into the future. A pipeline was inspected in 1986, 1990 and 1994. As part of the maintenance program in 1999 several joints of pipe were removed from the line and the estimated severity of corrosion on these joints, for 1999 obtained using the growth model, were compared with the measurements obtained from the field. A major success of this exercise was the rescheduling of a costly in-line inspection while obtaining accurate estimates of the 1999 severity. By changing the anticipated inspection frequency the cumulative present value cost to the future maintenance activities on this over the next 20 years has been reduced by \$ 30 million. The growth analysis has been shown to be reliable based upon the results of the 1998 and 1999 dig programs.

It is not simply the most severe corrosion

features that must be removed after an inspection, rather, it is also those expected to be growing at the fastest rate. The decisions made during the 1999 dig program, and the previous 1998 dig program, were different than those formerly used for this particular pipeline. A full description of the methods used to choose the dig sites, as well as a statistical comparison of the measured corrosion and that predicted by the growth model is provided in this paper.

5) Integrity and remaining life of underground pipelines containing corrosion and stress corrosion defects

Por Burke S. Delanty, CC Technologies Canada Ltd., Canada y John A. Beavers, Carl E. Jaske, y Patrick H. Vieth, CC Technologies, USA

Corrosion and stress corrosion cracking (SCC) continue to be Integrity concerns for the pipeline industry. This paper presents a methodology to quantify the effects of corrosion and SCC defects on the failure stress and remaining life of pipelines. The morphology of attack can range from general wall thinning to localized pitting to axial or circumferential cracks. A flow strength failure criterion is used for general wall thinning and localized pitting; whereas, both flow strength and fracture toughness failure criteria must be considered for crack like defects. Remaining life is predicted using estimates of critical flaw dimensions at the maximum allowable operating pressure (MAOP) and the flaw growth rate.

6) Management of the integrity of underground pipelines containing stress corrosion defects

Por John A. Beavers, CC Technologies, USA y Burke S. Delanty, CC Technologies Canada Ltd., Canada

Two forms of external stress corrosion cracking (SCC) have been identified on underground pipelines. They are referred to as near-neutral pH SCC and high-pH SCC and develop under different field conditions. Near-neutral pH SCC is most commonly associated with shielding tape coating while high-pH SCC is associated with disbonded coal tar and asphalt coatings. Both forms of cracking pose integrity concerns for pipeline operators. This paper presents an overview of the two forms of SCC and a methodology for the management of pipelines containing these defects.

7) Use of corrosion coupons

Por Thomas J. Barlo, Ph. D., CC Technologies, Inc. USA y Orvaldo Rossi, Transportadora de Gas del Norte S.A.

The use of coupons in a corrosion integrity

management program is reviewed. Their use includes monitoring the level of cathodic protection, relating the corrosion rate to the level of protection, and estimating the corrosion growth rates of in-line inspection defects for re-inspection and maintenance scheduling. The results from several field studies are analyzed to illustrate the significance of various coupon design parameters and features, and environmental conditions. Methods to determine the general and maximum pitting rates using coupons are illustrated and discussed.

Key Words: coupons, corrosion rate, cathodic protection, pipelines, integrity management.

8) Cathodic Protection Criteria

Por Thomas J. Barlo, Ph. D., CC Technologies, Inc. USA

The understanding, application, and monitoring of cathodic protection, and its limitations are reviewed and discussed. The criteria for cathodic protection that measure its effectiveness are discussed in detail from the perspective of the NACE International Recommended Practice RP0169-96 and the limitations and modifications the criteria entail. The role of cathodic protection and the criteria in a corrosion integrity management program are reviewed in detail from the programmatic view of monitoring, condition assessment, risk assessment, mitigation, and reporting.

Key Words: corrosion, criteria, cathodic protection, pipelines, integrity management.

9) Pipeline Safety

Por John McCarthy, National Energy Board, Canada

The National Energy Board regulates the safety and environmental protection of over 45,000 km of oil and natural gas pipelines in Canada. The NEB has been in existence since 1959 and has developed its approach to the regulation of pipeline safety over these years.

The NEB's two principal sets of regulations for pipelines are the Onshore Pipeline Regulations and Pipeline Crossing Regulations. The Onshore Pipeline Regulations specify the requirements for the design construction and operation of pipelines. These regulations have recently been revised to become more goal-oriented with the purpose of improving their effectiveness. The Pipeline Crossing Regulations address the prevention of third party damage to the pipelines and is in the process of being redrafted as the Damage Prevention Regulations.

The NEB's experience with regulating pipeline safety and its current approaches will be discussed.