



1. INTRODUCTION

CAPCIS has over 25 years experience of providing high-level, independent consultancy and specialised testing services to a wide range of industries world wide, in particular to the Oil & Gas Industry. Our knowledge of corrosion, materials and production chemistry issues in locations throughout the world means that we can frequently adapt solutions developed for one particular region to suit conditions elsewhere.

We believe that our experience and professional approach in combination with the wide range of services that we offer to the Oil & Gas Industry is unique and our success in providing clients with cost effective solutions is reflected in the significant growth in CAPCIS business over recent years.

Further information on CAPCIS is available from our web site www.capcis.com

2. CORPORATE PROFILE

CAPCIS has established itself as one of the world's leading independent consultancy companies specialising in the areas of corrosion, failure investigation, materials specification, production chemistry and corrosion management.

CAPCIS was originally spun off as an independent company from the Corrosion and Protection Centre within the University of Manchester over 30 years ago, to provide a commercial focus for the knowledge and ideas emerging from the University. Since then the company has grown from strength to strength and now employs over 60 qualified engineers, technologists and experienced industrial consultants and operates out of offices across the UK in Manchester (Head Office), Aberdeen and Oxford, in Sharjah (UAE) and through agency representation in Libya, Qatar and elsewhere. In January 2007, CAPCIS Ltd became part of the Intertek Group of Companies.

CAPCIS has developed an enviable reputation across many industrial sectors as well as the legal and insurance sector, for its fundamental understanding of the behaviour of materials within different environments and provides the highest quality consultancy support to industries worldwide. It is with some justification that CAPCIS claims to be the largest group of its kind in Europe, and its growth in recent years substantiates this.

The Corrosion Management Services that CAPCIS offer differ significantly from inspection based management systems and services as CAPCIS has the ability to take a holistic view of an asset, providing a proactive, economics driven strategy for the mitigation of corrosion related failures. This focuses on meeting both the short-term operational, and long-term strategic objectives of the asset, whilst ensuring asset integrity and reducing life cycle costs.

CAPCIS' services are further augmented through the close integration of technical, engineering and management resources from partners companies with the Intertek Organisation. The CAPCIS operations are

conducted under a quality assurance plan, which is registered with BS Quality Assurance Ltd (registration number FS 27760) as compliant with BS EN ISO 9001:2000. All work, conducted by CAPCIS and its sub-contractors is carried out in accordance with in-house procedures and documentation.

3. **ADVANCED TESTING – CHEMICAL TREATMENT, PRODUCTION CHEMISTRY, MATERIALS SELECTION**

CAPCIS specialised testing services provide a wide range of facilities and expertise for the evaluation of materials, chemical treatments and coatings for the Oil & Gas, Petrochemical, Chemical and Manufacturing Industries.

CAPCIS' technical capabilities, independence and professional approach are the key strengths that have enabled the company to develop a significant client base for testing services, either as stand alone projects or as an integral part of consultancy or integrity management contracts.

Many projects require the use of sophisticated techniques and equipment in order to enable us to provide the most reliable recommendations. A full range of electrochemical techniques, which are selected as appropriate for specific applications, compliments the test facilities described below. In addition, comprehensive analytical facilities are available.

While it is often appropriate to carry out tests in accordance with International Standards, CAPCIS has been at the forefront of the development of new test techniques to address specific issues such as materials performance in sour environments, inhibition of pitting corrosion and preferential weld attack.

Laboratory based projects can be extended to include field performance assessment and development of corrosion and chemical management systems

Advanced Testing Facilities incorporate:

Materials Performance – Includes the largest independent High Pressure Test Facility in Europe, a unique Sour Service Testing facility and extensive Coatings and Non Metallic Testing facilities.

Chemical Treatment – Includes an extensive range of Advanced Testing facilities for the independent evaluation of chemical inhibitors for wide ranging oil and gas, water and other industrial applications

Testing services include studies on:

- Corrosion inhibition
- Biocide treatments
- Scaling and scale inhibitors
- Wax deposition
- Foaming and emulsion tendency
- H₂S scavengers
- Corrosion & Environmental Cracking Testing
- Electrochemical Testing

- Environmental Exposure Testing
- High Pressure/High Temperature testing
- Testing in Sour (H₂S) Environments
- Inhibitor and Chemical Treatment Evaluation
- Evaluation of Coatings and Non-metallic Materials
- Specialist Chemical Analysis
- Preferential Weld Corrosion
- MIC Testing Services

Testing complements our consultancy services by providing performance data for specific environmental conditions. Our Specialised Testing services provide a wide range of facilities for evaluation of materials, chemicals and coatings. As well as standardized test methods, CAPCIS frequently perform bespoke test programmes to meet Client's specific requirements. Particular areas of expertise are electrochemical testing; testing of materials in sour (H₂S-containing) environments; testing with flow simulation; and evaluation of inhibitors and chemical treatments. Tests at high temperature and high pressures can be performed in the CAPCIS autoclave laboratory.

CAPCIS has proven experience of performing such studies through our dedicated laboratory for sour service testing and handling of H₂S, as well as an extensive autoclave testing facility. CAPCIS has more than 15 years experience of testing metals and alloys for oilfield service at elevated temperature and pressure and in sour-gas environments reaffirming our strong testing position.

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Materials Testing for Sour Service

Environments containing hydrogen sulphide ("sour" environments) are extremely aggressive towards many materials including carbon and low alloy steels, corrosion resistant alloys and polymeric materials.

Development of sour oil and gas resources at high pressures and temperatures is creating increased demands on material performance. Testing is essential to develop new materials and to qualify materials for new service conditions as well as for quality control purposes.

Sour service testing at CAPCIS is carried out in a dedicated laboratory by experienced personnel. A unique hydrogen sulphide scrubber system prevents release of hydrogen sulphide gas, reducing environmental impact to the minimum. CAPCIS experts have a wealth of knowledge and experience in sour corrosion and related fields including metallurgy, non-metallic coatings and materials, pipeline engineering, welding, oilfield chemistry, corrosion inhibition and monitoring technology



Standard Sour Service Test Procedures Include:



External loading of pipe for SOURTEST



Preparation of a 45" pipe for SOURTEST

- Hydrogen induced cracking (HIC) tests: e.g.
- NACE TM0284-96
- Sulphide stress-corrosion cracking (SSCC) tests: e.g. NACE TM0177-96, EFC 16
 - Constant load tensile
 - Four-point bend
 - C-ring
 - Slow strain-rate test
- Full Ring Tests: OTI 95 635
- Autoclave testing of organic coatings: e.g. NACE TM0185-93
- Testing of elastomeric materials: e.g. NACE TM0187-93, TM0296-96

Special Test Procedures

When the product form or application means that standard test methods are not suitable, we can use our experience to develop bespoke test procedures for specific projects.



Full Ring Testing

CAPCIS developed the Full Ring Test, or SOURTEST, to assess the resistance of pipe and welds to sour conditions. The procedure tests a full section of pipe, not small coupons, hence retaining residual stresses from pipe-making and girth welding. The loading method provides a more realistic stress than in small-scale tests. Hydrogen permeation measurements and ultrasonic surveys can be performed during the test for additional information. The procedure is standardised in DTI document OTI 95 635.

Inhibitor Testing

Our sour service laboratory enables us to evaluate the performance of corrosion inhibitors in the presence of hydrogen sulphide, including effects on hydrogen permeation.

CAPCIS Projects

The following selection of recent projects demonstrates some of the range of CAPCIS' experience in sour service testing:

- SSCC testing of downhole tubulars in sour conditions with inhibitor treatments.
- Full-ring testing of SAW pipes.
- Quality control HIC and SSCC testing of reinforcement wires for flexible pipe.
- High pressure-high temperature corrosion & stress-corrosion testing of CRA materials
- Testing of Super-13%Cr material in CO₂ –H₂S at 200 bar pressure.
- Assessment of corrosion inhibitors for acidification treatment in sour wells.
- Quality Control HIC and SSCC testing of HFI-welded pipe
- Hydrogen permeation studies.
- Long-term sour corrosion testing of carbon steel wires
- SSCC testing of welded 13%Cr line pipe at ambient and elevated temperature and pressure.
- Slow strain rate testing in completion fluid systems at elevated temperature.
- Evaluation of organic coatings in sour conditions at elevated temperature and pressure.