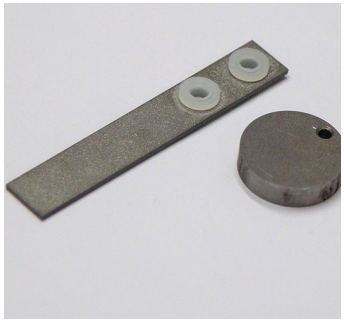
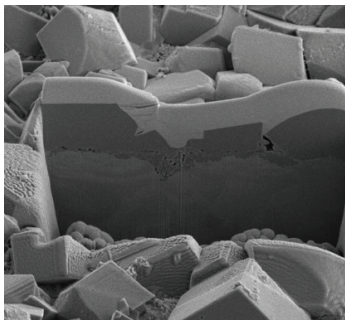
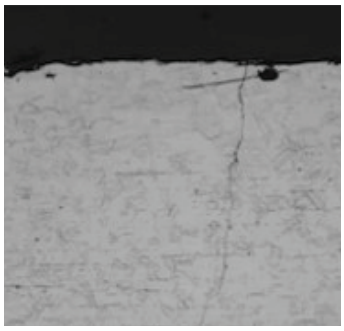
LBBC BASKERVILLE

Corrosion testing made easy

OIL AND GAS • HPHT CORROSION • CORROSION TESTING • EXTREME CONDITIONS







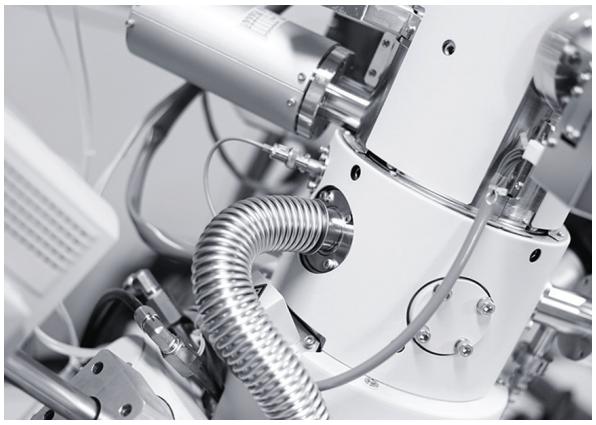
LBBC BASKERVILLE

LBBC Group

LBBC Group is a fifth generation, family, advanced engineering business. LBBC Group is made up of four independent divisions: LBBC Beechwood, LBBC Technologies, LBBC Resomation and LBBC Baskerville.

LBBC Baskerville

LBBC Baskerville joined the group in June 2015, formerly known as Baskerville Reactors and Autoclaves. The name has a long heritage and is recognised as a market leader in the design and manufacture of pressure systems and autoclaves. The company has been rebranded as LBBC Baskerville with a new vision.



Research & Development

We strive on improving our products and we are continuously investing in new product development to enhance corrosion testing methods and standards. We have collaborated with University of Leeds working with them on their Leeds Oilfield Corrosion Programme led by Prof. Anne Neville.

Our Vision

Our ultimate goal is work with industry to help reduce corrosion failures and improve corrosion testing and industry testing standards.

in partnership with

UNIVERSITY OF LEEDS

LBBC BASKERVILLE

Corrosion testing made easy

Future Corrosion Testing Developments

At LBBC Baskerville, our vision is to provide products that will help to enhance corrosion control, prediction and management in order to improve on the safe and efficient recovery of hydrocarbons. With the ultimate goal of playing a role in preventing catastrophic corrosion related failures across the industry.

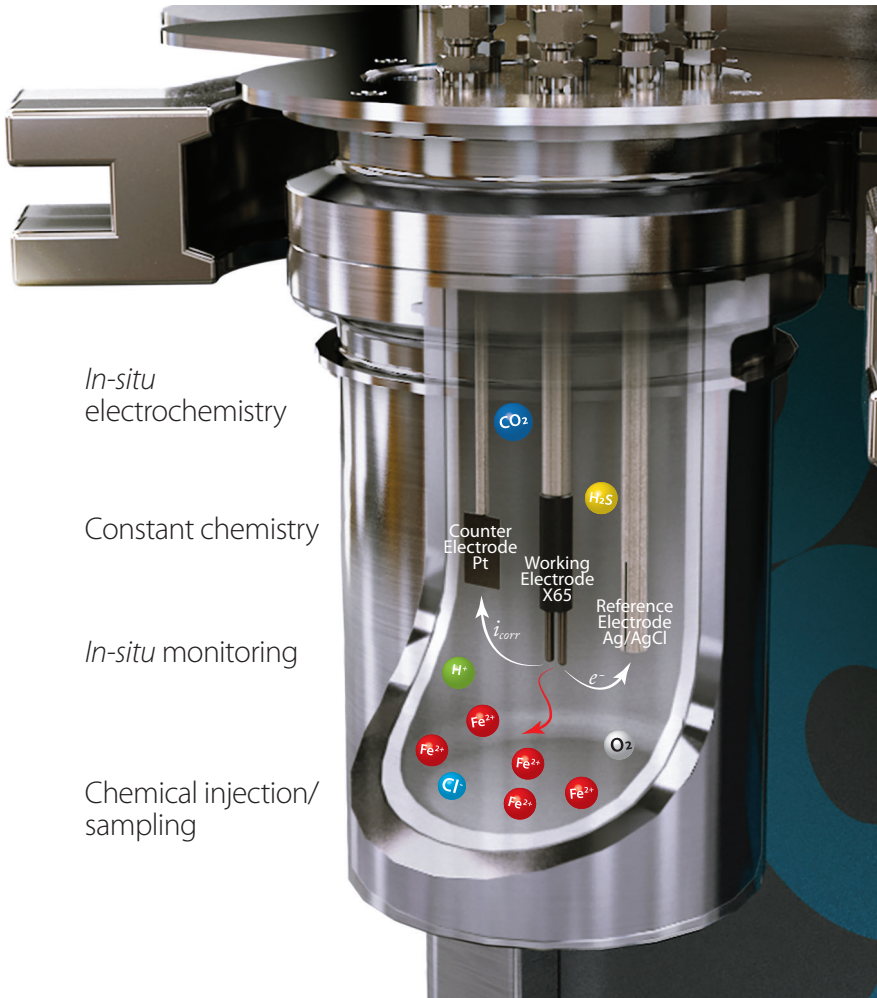
Working in partnership with the University of Leeds, specifically a team of corrosion experts lead by Professor Anne Neville; LBBC Baskerville are continuously developing new products that can help replicate field conditions realistically with the aim of improving corrosion testing, repeatability and industry standards.

Products in the pipeline

- Severe service HPHT chemically inert autoclave with electrochemistry
- HPHT autoclave with electrochemistry in dynamic conditions in the presence of H_2S
- Fully automated system with in-line inhibitor injection, brine sampling and the ability to monitor the brine chemistry for the duration of the test (O_2 monitoring, pH monitoring, Fe^{2+} concentration monitoring)
- Coupon/electrode retractable system to remove/insert coupons periodically to eliminate pre/post test corrosion and to analyse corrosion mechanisms over time without performing multiple tests
- Constant chemistry autoclave system featuring all of above

Advanced autoclave systems to incorporate:

- Dynamic loading devices (stress corrosion cracking)
- *In-situ* tribometer (Tribo-corrosion)
- *In-situ* jet impingement (erosion-corrosion)
- Flow loop (flow-induced corrosion)
- XRD/Raman flow cells (*in-situ* corrosion product formation)



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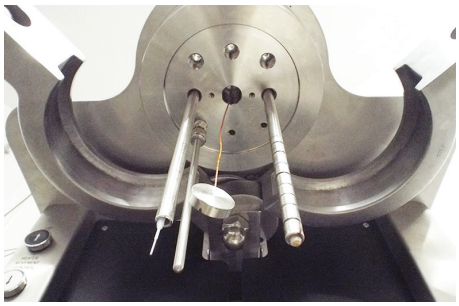
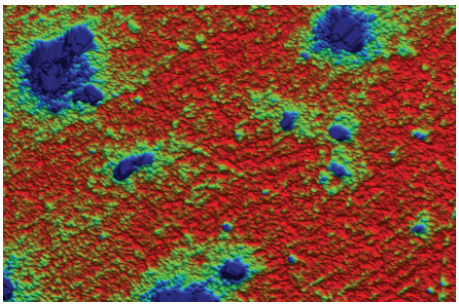
Future Corrosion Testing Developments

Linking Laboratory Corrosion Testing to Field Applications

Realistic Field Conditions	Improving Testing Methods & Equipment	Corrosion Mechanisms Simulated
Extreme Environments • Pressure and temperature conditions • Highly corrosive (CO_2/H_2S, HCl, Acetic Acid)	**Advanced CRAs and Liners:** C276, Tantalum, PTFE, glass lined	**CO_2 Corrosion** • General corrosion • Localised corrosion (pitting, Ccevice corrosion) • Corrosion product formation: $FeCO_3$, Fe_3O_4, $Fe_2(OH_2)CO_3$ **H_2S Corrosion** • Stress corrosion cracking • Sulfide stress corrosion cracking • Localised corrosion (pitting, crevice corrosion) • Hydrogen permeation • Corrosion product formation: FeS **Preferential Weld Corrosion** • Localised corrosion (pitting, crevice corrosion) • Intergranular corrosion • Galvanic corrosion **Flow-induced Corrosion** **Tribo-Corrosion** **Erosion-Corrosion** **Top-of-the-line Corrosion**
Corrosive Fluid Chemistry, Properties & Variance: • Constant chemistry (pH, Fe^{2+}, SR) • Accurate CO_2/H_2S partial pressures • O_2 concentration (<50 ppb) • Seawater composition (% water cut) • Presence of sand • Inhibitor dosing	**Controlling chemistry:** Online monitoring, filtration system, injection/dosing system, larger dual autoclave **Sampling system:** Solution analysis ***In-situ* sensors:** pH, O_2 content, working/counter/reference electrodes	
Properties/Condition of Corroding Surface: • Corrosion rate and mechanisms • Corrosion product formation • Properties of the surface • Exposure times	**Coupon configurations:** Weight loss, working electrode, micro/multiple electrodes, crevice formers, stressed coupons, dynamic loading, *in-situ* tribometer, retractable coupons/electrodes, Devanathan cell **Real-time Corrosion Product Analysis:** Flow cell for *in-situ* XRD, window for digital image correlation **Control of exposure time:** Retractable/insertable coupon/electrode system, dual autoclave, internal flow gasket	
Simulating Flow Regimes/ Hydrodynamics: • Stagnant areas (bottom and top of the line) • Reynolds Number (laminar/turbulent flow) • Wall shear stress	**Controlled Flow:** Rotating cylinder/disk electrode, flow loop, *in-situ* jet impingement	

APPLICATION → **AUTOCLAVE** → **RESULT**





Get in touch - we understand your testing needs!

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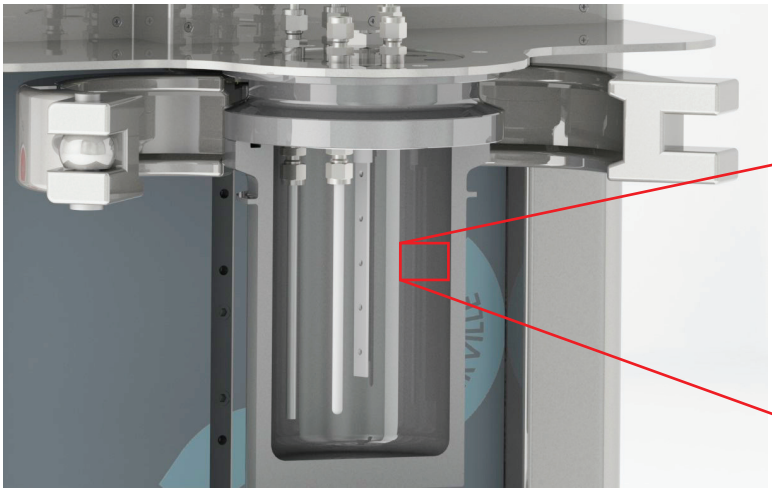
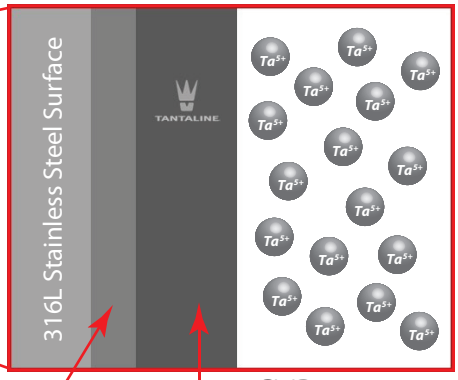
Corrosion Testing Autoclave Tantalum Treatment

*Tantaline® treatment of **ALL** wetted parts:*



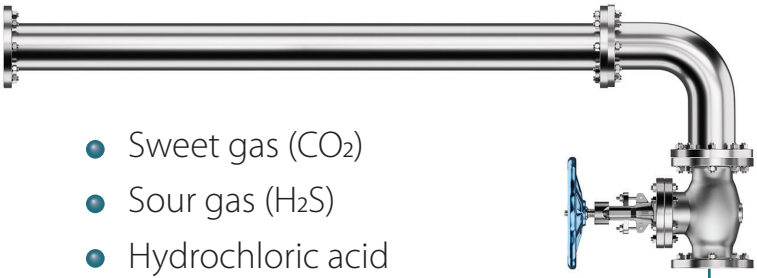


Superior corrosion resistance for aggressive service conditions

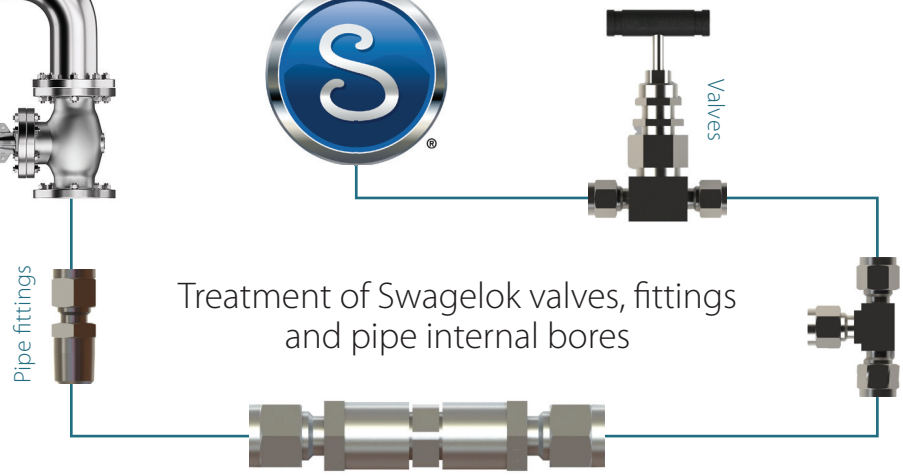
Diffusion layer

50 µm Tantalum layer

CVD process



- Sweet gas (CO_2)
- Sour gas (H_2S)
- Hydrochloric acid
- Sulfuric acid
- Acetic acid
- Nitric acid
- Chlorine
- Many other process fluids



Treatment of Swagelok valves, fittings and pipe internal bores

• Cost effective • Superior corrosion resistance • Chemically inert •
• Resistant to SCC and pitting • Chemical vapour deposition •

Visit our website **https://lbbcbaskerville.com** or contact us for more information

LBBC BASKERVILLE

Corrosion testing made easy

Corrosion Testing Autoclave Range

LBBC Baskerville's corrosion testing autoclaves have been designed and manufactured, primarily for the oil and gas industry. The equipment can also be used in a number of other industries to simulate high pressure, high temperature (HPHT) environments such as nuclear, geothermal, carbon capture and storage, energy, defence, pharmaceutical and many more industries. The system has been designed to suit both industry and academic environments.

The autoclave's primary use is to evaluate material, coating or inhibitor performance, corrosion failure analysis in the form of weight loss coupons or electrochemical studies in aggressive high pressure (HP) and high temperature (HT) environments representative of the conditions found in the field throughout the oil and gas industry.

Key benefits:

- High levels of built in safety: impossible to open autoclave whilst pressurised
- Ease of use and handling: one bolt fast release open/closure and lifting/lowering system
- Modular in design: vessel stand (suitable for fume cupboards), vessel design and optional features
- Enhanced process control: minimise heat-up time and pre-corrosion
- Corrosion monitoring system available: built-in electrochemistry and potentiostat
- Corrosion expertise: ongoing technical support throughout the product life

All of LBBC Baskerville's pressure vessels are designed in accordance to the ASME Section VIII Division1 standard. PED, CE, certificates are standard and the China Special Equipment Manufacture Licence certificate is available upon request.

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Corrosion Testing Autoclave Range

Key features:

Port 1 ½" NPT Centre Port
- Weight loss coupons or working electrode configurations
- Multiple/single electrode *Conax* fitting
- In-line magnetic agitation (coupon holder mounted on underside of vessel cover)

Port 2 ¼" NPT
- Ag/AgCl reference electrode
- Cooling coil/spare port

Port 3 ¼" NPT
- Platinum counter electrode
- Cooling coil/spare port

Port 4 ¼" NPT
- Spare/secondary manual vent valve

Port 5 ¼" NPT
- Gas (CO_2/N_2/H_2S) inlet valve and dip tube

Port 6 ¼" NPT
- Autoclave vent valve and pressure relief valve

Port 7 ¼" NPT
- PT100 temperature probe and thermowell

Port 8 ¼" NPT
- pH probe
- Spare port

Port 9 ¼" NPT
- Pressure system (inc. pressure gauge, transducer and rupture disc assembly

Model	Volume	Working pressure	Working temperature	Material	Relevant Applications/ Corrosion Mechanisms	Typical Testing Standards
CTA-01	1-5L	100 bar 1450 psi	200°C/ 392°F	316L Stainless Steel (UNS S31603)	CO_2 corrosion, inhibitor evaluation, pitting corrosion	ASTM G31, G11, G46, G48, G170
CTA-02	1-5L	200 bar 2901 psi	400°C/ 752°F	C276 Hastelloy (UNS N10276)	H_2S corrosion, sulfide stress corrosion cracking	NACE TM0177, TM0316, MR0175/ISO 15156; EFC 16, 17
CTA-03	1-5L	100 bar 1450psi	200°C/ 392°F	316L Stainless Steel + Tantalum	Deep well acidizing, intergranular corrosion	ASTM A262, G28

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