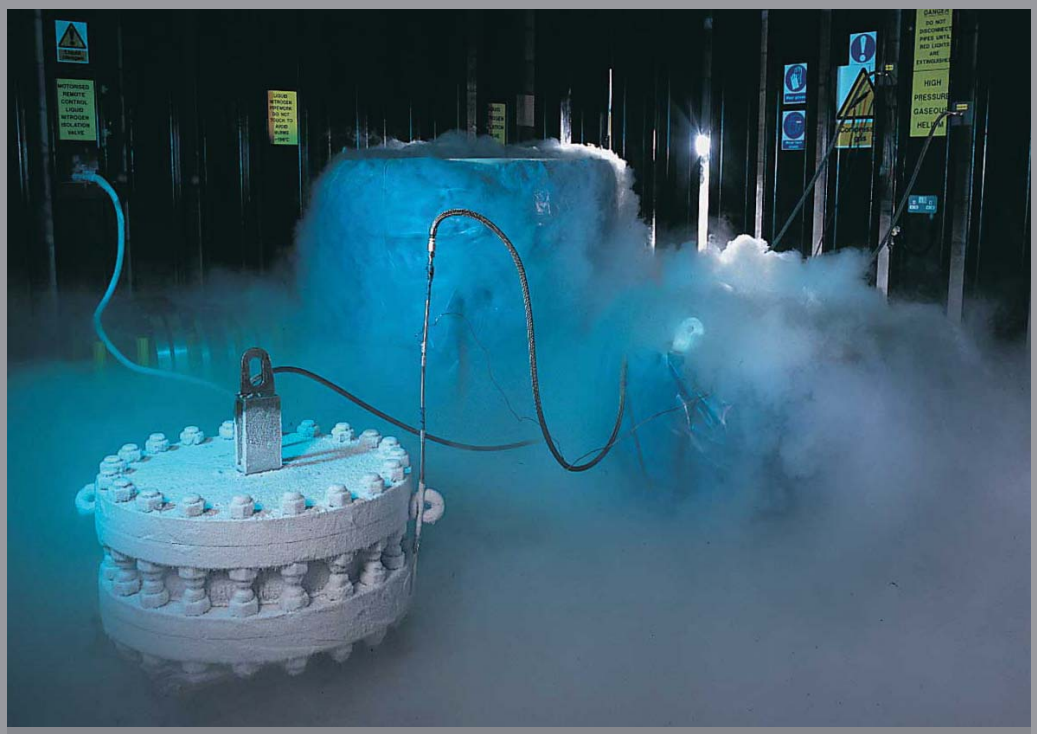
GOODWIN



Cryogenic, Low Temperature and High Pressure Gas Testing Facility

Goodwin - a success story in LNG

The following is a brief resume of Goodwin supply to LNG projects where, over the last decade, Goodwin has furnished more than US$ 80,000,000 of product.

Year	Project	Country	Customer	Contractor (Purchasing)
1992 - 2000	MLNG: Dua & Tiga Plants	Malaysia	Petronas	JGC Corp, Japan
1994 - 2006	Qatargas Trains 1 - 7	Qatar	Qatargas I, II, III & IV	Chiyoda, Japan
1995 - 1998	Incheon LNG Import Terminal	Korea	Korea Gas Corp	Daelim Industrial Co, Korea
1996 - 2005	Bonny Island Trains 1 - 6	Nigeria	Nigeria LNG Ltd	MW Kellogg, UK
1997 - 1998	RasGas Trains 1 & 2	Qatar	RasGas Co	JGC Corp, Japan
1998 - 2003	Oman LNG	Oman	Oman LNG	Foster Wheeler, UK
1999	Ourhoud LNG	Algeria	Sonatrach	Bechtel Corp, USA
2000	Tongyeong LNG Import Terminal	Korea	Korea Gas Corp	Daelim Industrial, Korea
2000	Pinson LNG Peak Shaving Plant	USA	Alabama Gas Co	Black & Veatch Prichard, USA
2000 - 2004	Trinidad Atlantic Trains 2 - 4	Trinidad	Atlantic LNG	Bechtel Corp, USA
2001 - 2008	RasGas Trains 3 - 7	Qatar	RasGas Co	Chiyoda, Japan
2002 - 2003	North West Shelf Ph 4	Australia	Woodside Energy	KBR, Australia
2002 - 2009	LNG Carriers	Korea	Various	Daewoo/Hyundai/Samsung, Korea
2003 - 2008	Hammerfest LNG	Norway	Statoil	Linde, Germany
2004 - 2008	Sakhalin II PHII, LNG Plant	Russia	SEIC (Sakhalin Energy)	Chiyoda, Japan
2005 - 2007	North West Shelf Ph 5	Australia	Woodside Energy	Foster Wheeler, UK
2006	South Hook LNG Terminal	UK	South Hook LNG	CB&I, UK
2006 - 2008	Adriatic LNG Terminal	Italy	Terminal GNL Adriatico	Aker Kvaerner, USA
2006 - 2008	Yemen LNG	Yemen	Yemen LNG Co	Technip, France
2007 - 2008	Golden Pass LNG Terminal	USA	Golden Pass LNG	CB&I, USA
2007 - 2009	Peru LNG	Peru	Peru LNG	CB&I, UK
2008	Skida LNG	Algeria	Sonatrach	Kellogg Brown & Root, USA
2008	Angola LNG	Angola	ChevronTexaco	Bechtel Corp, USA
2008/2009	Pluto LNG	Australia	Woodside Energy	Foster Wheeler, UK
2010	Dalian LNG	China	PetroChina Dalian LNG	China Huanqiu C & E Corp
2010	Jiangsu LNG	China	PetroChina Jiangsu LNG	China Huanqiu C & E Corp

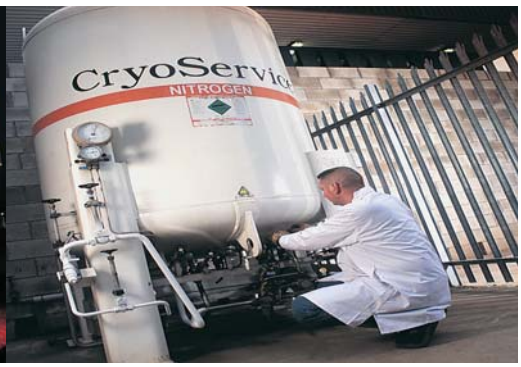
Goodwin Dual Plate Check Valves: achievable seat leakage rates

Goodwin International is capable of incremental pressure testing at temperatures from room temperature down to -196°C.

Goodwin has a custom built test chamber that allows the safe testing of valves with helium at the full design pressure of the valve (10000psig/690barg).

The test procedure is in accordance with Shell International specification SPE 77/200 and British Standard BS6364. Valves to be used in cryogenic or low temperature service are prepared and conditioned. With its range of Dual Plate Check Valve, Goodwin can offer the following achievable leakrates with metal to metal sealing:

- 700 cc/minute/inch diameter nominal bore (API 598)
- 300 cc/minute/inch diameter nominal bore (SPE 77/200 & BS6364)
- 100 cc/minute/inch diameter nominal bore (special) – additional cost



Goodwin's expertise and facilities

From top left to bottom right this page:
Explosion proof chamber
Onsite liquid nitrogen supply
72" ANSI 150 Check Valve on cryogenic test
Helium Mass Spectrometer 'Sniffer' for shell leak detection

From top left to top right right hand page:
Temperature recording Control panel
Positive Material Identification (PMI)

Back page:
42" ANSI 600lb Buttweld end Check Valve with test plates removed

At Goodwin International's cryogenic test facility, cryogenic and low temperature testing is conducted in accordance with Shell's MESC SPE 77/200 specification or like procedure. Goodwin can accommodate most clients' testing regimes. With its supply history of some 30 years into LNG and other liquid gas applications, Goodwin has proven experience and expertise in the rigorous testing of cryogenic valves and the meeting of customers' specifications and requirements.

Features

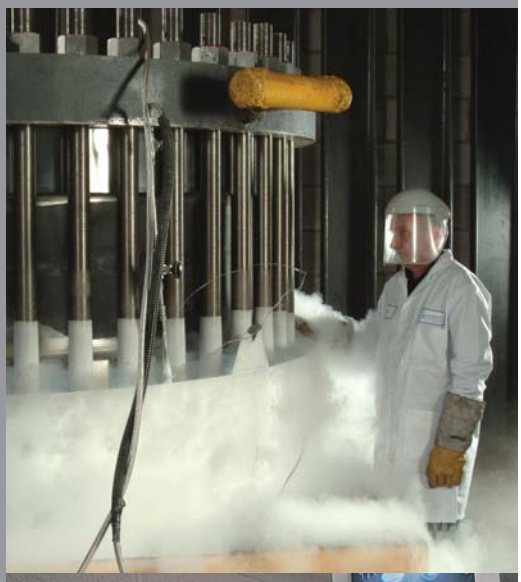
- BS EN ISO 9001 accredited facility
- Onsite technical support from qualified engineers
- Onsite skilled fitters
- Provision of Test Report certification

Facilities

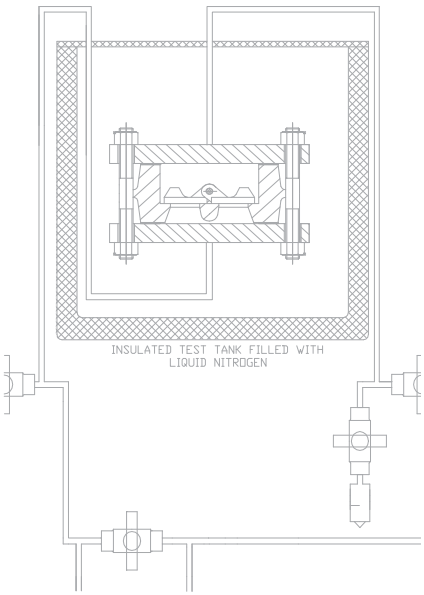
- Explosion proof chamber
- On-site bulk liquid nitrogen supply
- On-site portable PMI (Positive Material Identification)
- Thermocouple connections
- State-of-the-art portable microprocessor for temperature and time recording and graph plotting
- Calibrated equipment/regular calibration
- Helium Mass Spectrometer
- Drying out/warming furnace

Capabilities

- High pressure gas testing (10000psig/690barg)
- Testing down to -196°C
- Incremental pressure testing
- Testing to SPE 77/200 (and BS6364)
- Maximum size: to 2m (80") overall dimension
- Maximum weight: 10,000 kg



Low Temperature and Cryogenic Testing Procedures



*SPE 77/200 is the specification of Shell Global Solutions International B.V. for 'Valves in Low Temperature and Cryogenic Services'

Whether the valve is to be low temperature tested or cryogenic tested, the test method will be in accordance with *SPE 77/200 (latest revision) or similar procedure e.g. BS6364. The sequence of testing per SPE 77/200 is as follows:

- Hydrotest at ambient temperature
  Acceptance standard API 598
- Pneumatic test at ambient temperature
  Acceptance specification SPE 77/200
- Cryogenic/Low temperature testing

  Coolant Selection:

  Cryogenic testing at -196°C: Immersion of valve in liquid nitrogen.
  Low temperature testing -46°C: Immersion in liquid nitrogen vapour.
  Intermediate temperature testing: Immersion in liquid nitrogen or liquid nitrogen vapour.

  Temperature Control:

  Temperature is monitored by the use of thermocouples located both internally and externally of the valve body and internally and externally of the test tank. Once the required valve temperature has been achieved and stabilised the pressure test commences.

  Selection of leak test medium:

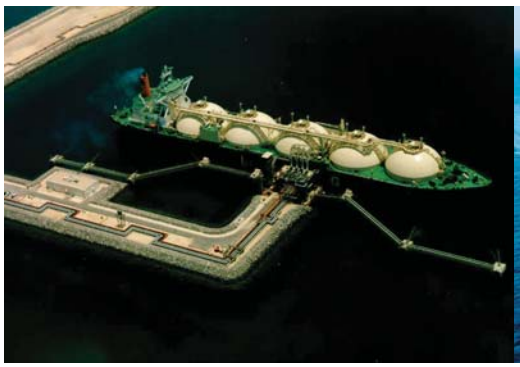
  Cryogenic ie. -196°C: pure helium.
  Low temperature ie. -46°C: 99% helium/1% nitrogen mix or pure helium.
  Intermediate temperature: pure helium, or 99% helium/1% nitrogen mix dependent on test temperature.

  Test Method – SPE 77/200:

  Pressure within the test valve is increased in 3 equal increments and seat leakage is measured using a series of calibrated flowmeters. The maximum pressure at which the valve is tested is limited by the Cold Working Pressure (CWP) as designated in ANSI B16.34 for the rating of valve under test.

  Shell (body) Leakage Test:

  Following seat leakage test, the valve is removed from the tank and the valve body integrity is tested whereby the body cavity is pressurised and a shell leak detection test carried out using a Helium Mass Spectrometer. The detection limit for acceptance is 5×10^{-4} ml/sec, this being defined as zero leakage.
- Test Reports
  All observations, data and results shall be recorded in sequence with dates and times into a single Test Report document.



Goodwin - the international company - performing where it matters

Based in the United Kingdom and seen as the market leader in the manufacture and design of Dual Plate Check Valves, Goodwin has a strong international presence exporting to over 50 countries. With some 30 years of supply to the world's hydrocarbon, energy and process industries, Goodwin has an enviable reputation for quality and reliability of product complimented by internationally competitive prices.

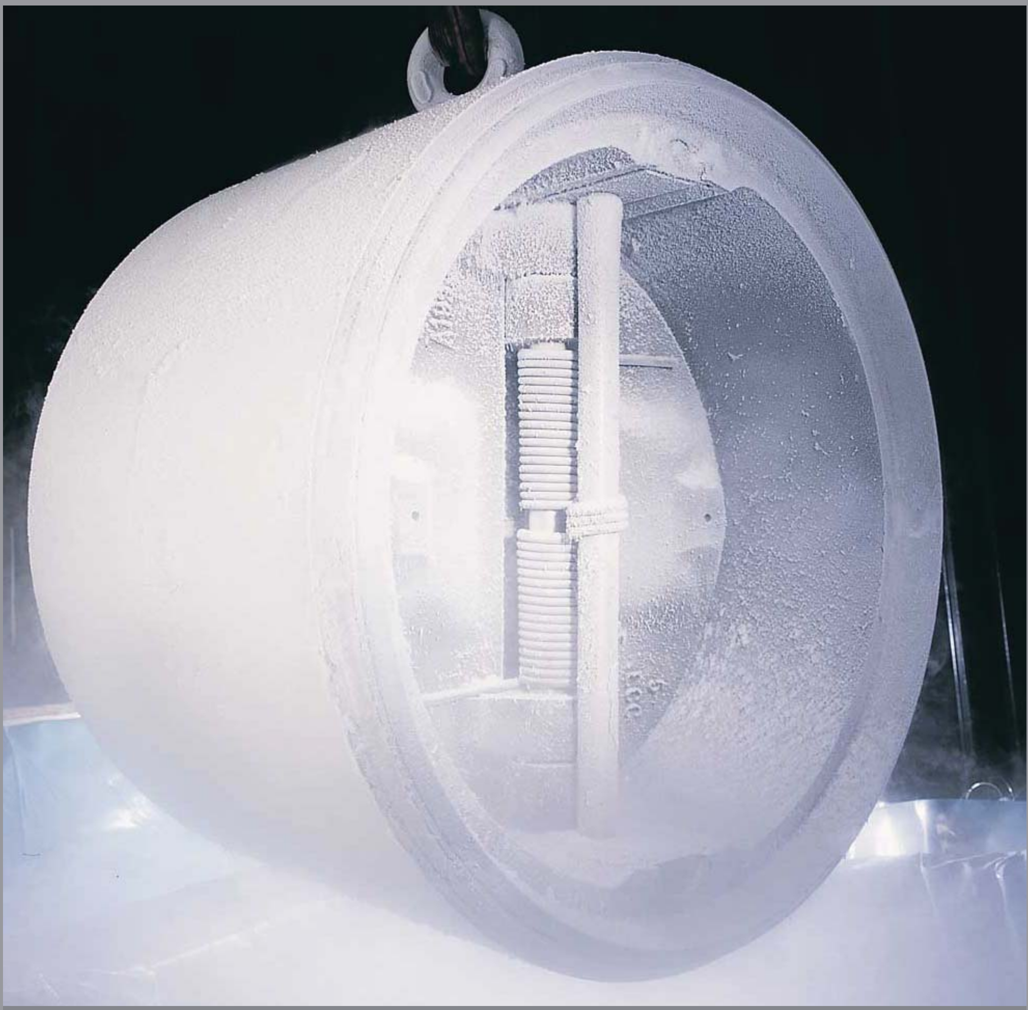
From its UK manufacturing base and through its network of agents and distributors holding some US$ 7,500,000 of inventory in 18 stocking locations worldwide, Goodwin offers outstanding support to its customers listed amongst whom are many of the world's end users, oil majors and international engineering contractors.

Goodwin and Liquefied Natural Gas (LNG)

Having 30 years of experience of valve supply into cryogenic applications coupled with in-house cryogenic testing, the last 2 decades in particular have seen Goodwin become a major supplier to the world's LNG industry. With its range of Dual Plate Check Valves, Goodwin has been the successful check valve supplier to a number of the world's most prestigious LNG export projects as well as many LNG ships and receiving terminal projects. The vast majority of valves are of 316 Stainless Steel construction for use in Liquefied Natural Gas at a temperature of -161°C. Often these valves are accompanied by a large number of valves of Low Temperature Carbon Steel (LTCS) construction for low temperature service applications and which require low temperature testing.

In support of its extensive involvement and business in the LNG and liquid gases industries, Goodwin has its own cryogenic test facility where, under supervision of its qualified engineers, Dual Plate Check Valves as large as 72" diameter can be tested at temperatures down to -196°C and to pressures of 6000psig/414barg.

Information on the complete range of Goodwin Dual Plate Check Valves is available on our website: www.checkvalves.co.uk



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Goodwin International Limited
Goodwin House, Leek Road, Stoke-on-Trent, England ST1 3NR
Tel +44 (0)1782 220000   Fax +44 (0)1782 208060
Web Sites: www.checkvalves.co.uk
E Mail: checkvalves@goodwingroup.com

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