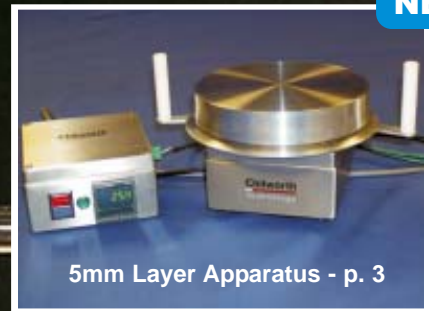
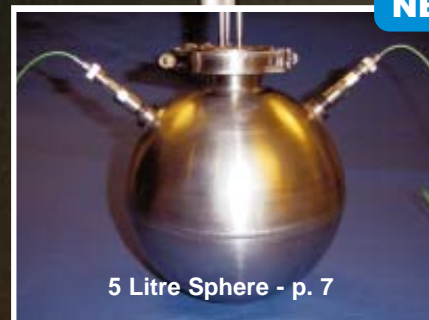


Instruments Catalogue 2004

NEW



NEW



REVISED



The latest process safety instrumentation from Chilworth Technology for R&D laboratories and on-site testing.

CONTENT

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Powder Thermal Stability Determination	3
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ASK THE EXPERTS SERVICE

Finding the right instrument to provide relevant and appropriate test data for your process safety needs is not always straightforward. Chilworth offer a free consultation to prospective buyers with one of our resident experts to ensure you purchase a cost effective solution to your equipment needs.

Call +44 (0)23 8076 0722 and ask for the Instruments Department.



Cover main picture MIT apparatus - p. 4

Specifications and information contained in this brochure are subject to change without prior notice.

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Process Safety Instruments

Choosing the right process safety instrumentation whether for a R&D laboratory or on-site testing is a complex task. A series of decisions needs to be made, including which tests to undertake, what instruments are required, and how to achieve compliance with national and international standards.

Global Service

Chilworth have been supplying apparatus since 1986 to countries as far a field as the USA, Egypt, India, Australia and the Far East. Our clients know that they will receive professional service, value for money, and equipment that has been proven in laboratory test trials within the facilities of Chilworth Technology prior to delivery. They also know that they are assured of comprehensive, easy to follow instruction manuals, efficient after sales support and comprehensive equipment warranties.

Training

We also recognise that people developing their own process safety laboratory may benefit from our knowledge and assistance. We can therefore provide training in instrument use to suit individual client requirements. This training can either be provided in our fully equipped process safety test laboratories or at our client's site.

Test Standards

This instrument catalogue encompasses the standard range of apparatus available from Chilworth. All instrumentation is manufactured to comply with relevant national and international standards including BS, IEC, ASTM, VDI, DIN, UN and European Commission Packaging and Labelling standards, to name a few. In fact our consultant engineers frequently contribute to various standards committees, with an understanding of industry's needs gained from their consultancy activities.

Custom manufacture

Chilworth also specialise in the custom manufacture of non-standard apparatus to either meet a client's specific in-house test requirements or to meet other standards not mentioned here. At the end of this catalogue you will find some examples of non-standard instrumentation product supply previously undertaken by us.

Declan Cowhig
Senior Instrument Development Eng.,
Chilworth Technology Ltd



POWDER THERMAL STABILITY DETERMINATION

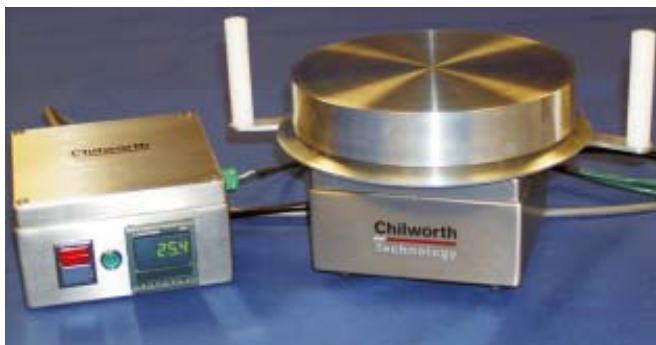
The self heating of powders is one of the more common causes of fires and explosions in powder processing operations. A range of temperature-ramped screening and isothermal test equipment is available to closely simulate plant conditions so that safe processing temperatures can be accurately determined.

If the heat developed by a reaction of the substance with air (exothermic decomposition) is not lost rapidly enough to the surroundings, self heating leading to self ignition can occur.

5mm Layer Ignition Temperature

NEW

For the specification of electrical equipment in hazardous areas. Equipment is manufactured to IEC 61241-2-1:1994 and EN 50281-2-1: 1998. This equipment has been further developed with a small hotplate unit and remote temperature control and data acquisition instrumentation.



5mm Layer Apparatus (data acquisition system not shown)

Aerated Cell

To study how thermal stability is affected by air flow through bulk powder (e.g in fluid bed dryers). (John Abbot, Prevention of Fires & Explosions in Dryers 2nd ed., IChemE).



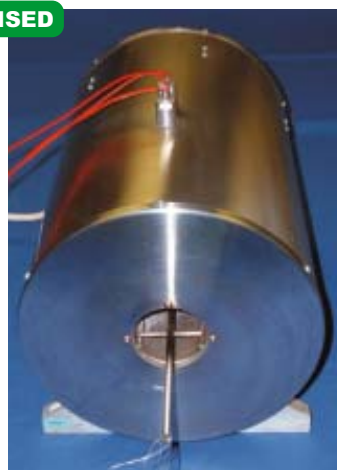
Internal view of oven - Aerated Cell and mount. Shows sample vessel and mounting stand together with air pre-heating pipework. For the Diffusion Cell test, the vessel lid is detached from the main vessel body to allow natural air diffusion.

Comes complete with oven, temperature controller equipment, data acquisition hardware and software, selection of thermocouples, set of vessels, mounting stand and comprehensive manual. Oven fitted with air pre-heating coil and side mounted air flow meter.

Air Over Layer

REVISED

To simulate conditions where powder layers occur inside dryers (e.g tray dryers or wall of spray dryers etc) (John Abbot, Prevention of Fires & Explosions in Dryers 2nd ed., IChemE)

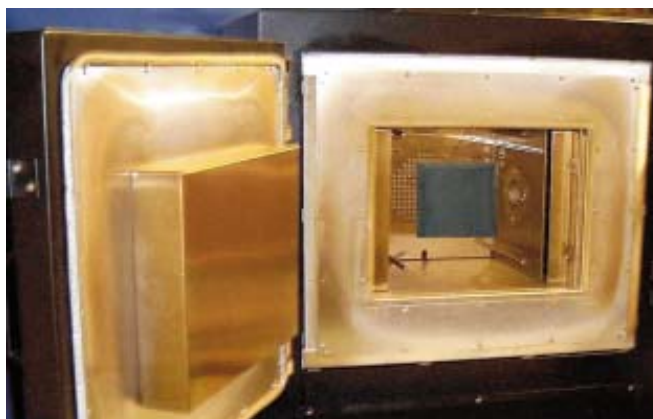


Air Over Layer Furnace

Basket Test

For the accurate study of the effect of scale on powder thermal instability. (PC Bowes, Self Heating : Evaluating and Controlling the Hazards, 1984, FRS)

Can also be used for regulatory testing studies to UN Class 4.2 and for packaging group classification, notification and other regulatory requirements. See page 6 for other regulatory test apparatus.



Basket test oven and internal basket.

Diffusion Cell

To study powder decomposition under bulk powder conditions where there is no forced aeration of the powder (e.g hoppers, silos or bulk powder dryers). (John Abbott, Prevention of Fires & Explosions in Dryers 2nd ed., IChemE).

Comes complete with oven, temperature controller equipment, data acquisition hardware and software, selection of thermocouples, set of vessels, mounting stand and comprehensive manual.

Refer to the Aerated Cell test apparatus photo and caption for details.

DUST EXPLOSION CHARACTERISATION

Assessment of the likelihood and consequences of industrial explosions in powder handling operations begins with the measurement of the explosion properties of powders. Dust explosion test equipment can measure both the sensitivity of dust clouds to different ignition sources as well as the strength of explosion.

Explosion Severity Measurement (20 Litre)

For the measurement of maximum explosion pressure and K_{st} value. Data is used in the design of explosion protection devices and systems. We can also supply other optional equipment with the 20 litre apparatus such as:

- i) Limiting oxygen concentration (LOC) equipment, which is used to establish the inert gas requirements to prevent explosion.
- ii) vacuum pump
- iii) igniter storage safe
- iv) an oxygen analyser and compatible head adaptor
- v) lifting gear for the head assembly, particularly useful when conducting extensive testing.
- vi) chemical igniter supply
- vii) spare parts kit.

One of the added benefits of using Chilworth Technology as the source of supply for this equipment is that we offer a comprehensive installation, commissioning and training package. Calibration contracts are also available.

This equipment allows testing in accordance with BS 6713: Part 1: 1986, ISO 6184/1-1985 and PrEN 14034: Parts 1 and 2.



20 Litre Sphere Apparatus

Explosion Demonstrator

NEW

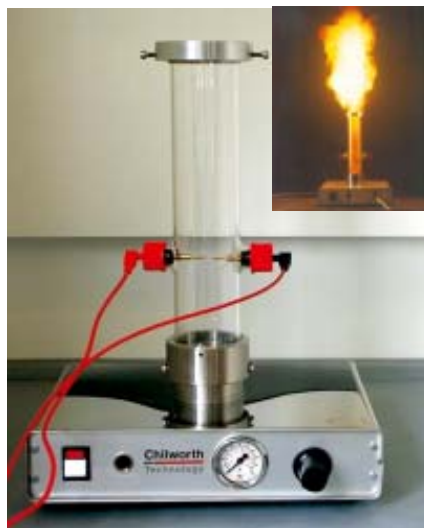
Self-contained kit to demonstrate small explosions to employees and students. Also ideal for seminar demonstrations. Manufactured from lightweight aluminium for easy carriage.



Explosion Demonstrator Kit

Explosion Screening

A laboratory version of the explosion demonstrator to establish if a dispersed powder can present a dust explosion risk. Manufactured from stainless steel. Fabricated in accordance with IEC, BS, ASTM, VDI standards.



Explosion Screening Apparatus

Minimum Ignition Energy

To measure the sensitivity of a dust cloud to electrostatic spark ignition so that appropriate precautions can be taken. The equipment allows testing to BS EN 13821:2002, IEC 61241-2-3, BS5958, ASTM E2019-99 (rev 2000), VDI Fortschritt-Berichte Reihe 3 Nr 134.



Minimum Ignition Energy Apparatus MIEIII

Minimum Ignition Temperature

Used in the specification of electrical equipment in hazardous areas. Manufactured to IEC 61241-2-1:1999 and EN 50281-2-1:1998. Also used to establish maximum permissible surface temperatures of process plant.



Minimum Ignition Temperature Apparatus



Separate PDF information sheet available for the Explosion Demonstrator

EXOTHERMIC REACTION HAZARDS ASSESSMENT

Exothermic chemical reactions lead to explosions and the release of flammable and/or toxic material to the environment. The key to reaction control and incident prevention is an understanding of the thermochemistry, obtained from laboratory tests.

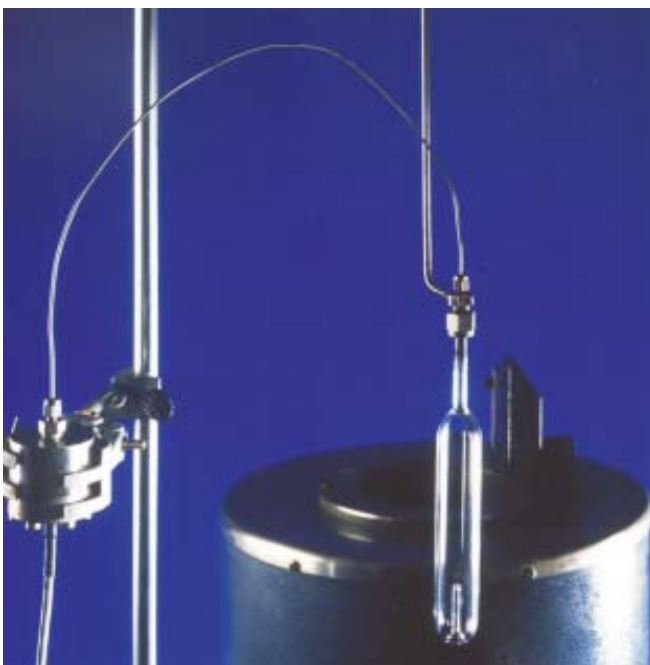
A range of instruments are detailed below which can identify and characterise reactions and enable emergency relief systems to be designed according to the DIERS methodology.

10g Screening Tool (Carius tube)

REVISED

An instrument for thermal stability and pressure rate screening to search for exothermic activity and gas generation.

- New high speed data acquisition capability.



Carius Tube Apparatus

Adiabatic Pressure Dewar Calorimeter ADCII

A large scale calorimeter with an ultra low phi factor which permits direct simulation of plant runaway conditions in the laboratory. Pressure and temperature data collected enable the specification of plant protection measures and the design of emergency relief systems.

Options include:

- Protective containment pod.
- Tempering cell for detailed vent design work.
- Gas evolution apparatus.
- Pumped additions (via high pressure pump).
- Custom manufactured high pressure and various coated Dewar vessels including accessories.
- Cooling coil options.



Adiabatic Pressure Dewar Calorimeter ADCII

Automated Gas Burette

For the measurement of Gas generation rate and quantity from chemical processes. This can be linked to either the Adiabatic Dewar Calorimeter equipment, carius tube or other isothermal calorimetry equipment (e.g. Mettler RC1).



Automated Gas Burette

REGULATORY APPLICATIONS

Transport, packaging, labelling and new substance notification (NONS) require various flammability and thermal stability data of materials to be determined. The following instruments provide this regulatory data.

Flammability of Solids (burning rate)

To study powder combustion properties for safety assessments and regulatory purposes. This apparatus permits testing to the EC's Classification, Packaging & Labelling of Dangerous Substances in the European Union Part 2, Testing methods, Jan 97 Test A10 Flammability of Solids. Also tests to the United Nations Transport of Dangerous Goods recommendations class 4 division 4.1. Burning behaviour of solids test apparatus can also be supplied for conducting tests to VDI 2263, Part 1, Section 1.2.



Flammability of Solids (burning rate) Apparatus

Oxidising Liquids

NEW

To study oxidising properties of liquids and to establish transport classification. This apparatus permits testing to the UN Transport of Dangerous Goods recommendations class 5 division 5.1.



Oxidising Liquids Test Chamber
(Acquisition and control system not shown here).

Oxidising Solids

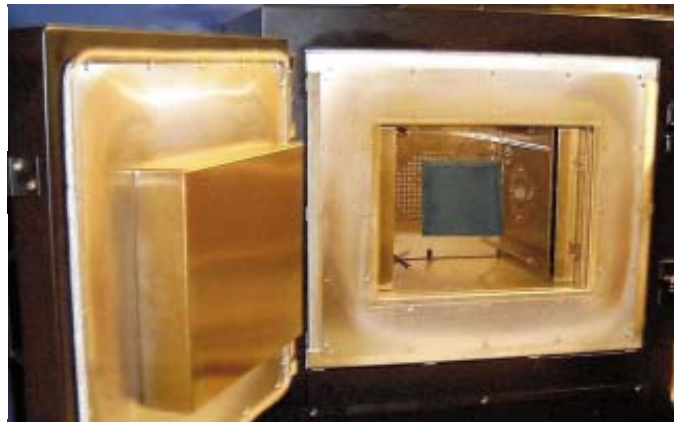
To study oxidising properties of solid materials and to establish transport classification. This apparatus permits testing to the UN Transport of Dangerous Goods recommendations class 5 division 5.1 and to the EC's Classification, Packaging and Labelling in the European Union -Test method A17.



Oxidising solids apparatus - shows sample loading chamber and hot coil.

Regulatory Self Heating (Basket)

For packaging group classification, notification and other regulatory requirements including the UN Class 4 division 4.2 test. Refer to page 3 (the equipment is the same as that supplied under basket test apparatus - page 3 apart from the number of baskets and the test method used).



Basket Test Apparatus Oven

Sustained Combustibility

To permit testing in accordance with the UN Transport of Dangerous Goods Recommendations Class 3 (Test L2) and also in accordance with DSEAR 2002.



Combustibility Test Cell
(hotplate not shown)

GAS & VAPOUR FLAMMABILITY MEASUREMENT

Process hazard studies require flammability data on all liquids and gases handled in industrial processes. The gas and vapour flammability range of test equipment provides the necessary information.

5 Litre Sphere

NEW

For the determination of the maximum explosion pressure and maximum rate of pressure rise of gases and vapours. This test apparatus permits testing in accordance with PrEN 13 673-1. Limited oxygen concentration tests can also be performed with this equipment.

Vessel custom manufactured in either stainless steel or Hastelloy for highly corrosive work. This item is sited within an oven which is included in the package.



5 Litre Sphere

Auto Ignition Temperature

REVISED

For determining the temperature at which a gas or vapour will auto ignite. Equipment can be supplied in accordance with either test standard ASTM E659-78(2000), DIN 51 794 (1978), IEC 60079-4 (1975) or to the European Classification, Packaging and Labelling in the European Union test A15. The ASTM version comes complete with full data acquisition software and hardware together with an Auto Ignition test worksheet.



Auto Ignition Test Apparatus (ASTM standard apparatus shown)

Break Flash (Minimum Ignition Current)

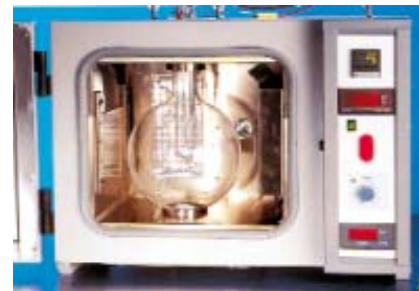
For the determination of gas grouping in the specification of electrical equipment in hazardous areas. For testing in accordance with IEC 60079-3 1990 (Pt 12).



Break Flash Apparatus

Flammable Range

For the measurement of upper and lower flammable limits of gases and vapours. This apparatus permits testing in accordance with ASTM E681-01 and has a temperature range of ambient to 200°C



LFL/UFL Apparatus (The oven shown can also be used for conducting gas and vapour flammability tests within a 5 litre sphere vessel.)

Flashpoint Measurement

NEW

A range of flashpoint test instruments are available covering various temperature ranges dependent upon which tester is purchased. The temperature ranges available are : 30°C to 300°C, -18°C to 71°C, 40°C to 350°C.

Applicable test standards are ASTM D93 (method A & B), ISO 2719 (method A & B), IP34 (method A & B), ASTM D3278, ASTM D3828-IP303, ASTM E502, ISO DIN 3679, BS EN 456, BS 6664 parts 3& 4, UN Class 3 Non viscous flammable liquids; BS 3900 part A13, IP 170, ISO 13 736.



Flashpoint Measurement Instruments

Minimum Ignition Energy (of gases/vapours)

NEW

For the determination of MIE data for gases and vapours.



MIE of Gases/Vapours (Vapour test vessel and electrode assembly shown.)

ELECTROSTATIC PROPERTIES DETERMINATION

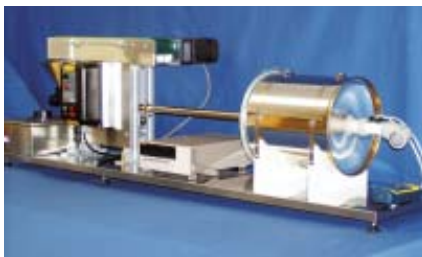
An extensive range of instruments to help identify electrostatic hazards and solve processing problems. These instruments can determine how readily static charge can be conducted away from a material and the likely risk of undesirable static build up. Each is designed to test materials in different forms including liquids, powders, films and fully fabricated equipment (e.g FIBC's, gloves etc).

LABORATORY TESTING

Powder Chargeability

NEW

Whenever one material moves against another, electrostatic charging will result. The net rate of charge acquisition will depend on both the rate of charge generation and the rate of charge dissipation. While measurements of resistivity and charge relaxation time reveal a material's ability to dissipate charge, chargeability indicates its propensity to generate it. Chilworth have developed an apparatus for measuring powder chargeability directly. The apparatus is based upon the principles given in BS7506 and BS5958.



Powder Chargeability Apparatus

Charge Relaxation Time (JCI 155v5)

NEW

For measuring charge relaxation times of powder products, films, solids and liquids. Manufactured to permit testing in accordance with BS 7506:Part 2: 1996 and IEC 61340-2-1. Data from this apparatus compliments conductivity and resistivity measurements. Relaxation time measurements are especially useful in differentiating between higher resistivity materials, both as regards to the risk of occurrence of problems and

in relation to applications with static electricity. Compact self contained and portable instrument. Digital storage of observations with opportunity for graphical presentation of results.



Charge relaxation time measurement apparatus (JCI 155v5) for powders, textiles and liquids.

Humidity Controlled Workstation

NEW

Electrostatic properties are substantially affected by relative humidity, so it is often imperative to test under known and controlled environmental conditions. This workstation provides a simple means of achieving controlled humidity and can be used for conducting all of the resistivity, conductivity and charge relaxation time tests described on this page.



Humidity Controlled Workstation for resistivity, conductivity and charge relaxation tests. A different size workstation can also be supplied for the Chilworth Chargeability apparatus if required.

Liquid Conductivity

NEW

Manufactured in accordance with BS5958, although test cells can be manufactured to comply with other standards if required. A compatible power supply and picoammeter are also supplied with the apparatus.



Liquid Conductivity Cell to BS5958

Powder Resistivity

REVISED

Manufactured in accordance with BS5958, although test cells can be manufactured to comply with other standards if required. A Custom manufactured High voltage power supply and a compatible picoammeter are also supplied with the apparatus.



Powder Resistivity Test Apparatus

Resistivity for Film and Solids

An ohm square test cell and/or a concentric ring type test electrode can be supplied for conducting tests in accordance with the guidelines of BS5958, and/or to BS EN 1149-1:1996, BS 6524:1984, BS 6233 and IEC 93:1980 if required, depending on whether tests are to be performed on film, textile fabric or solid electrical insulating materials. The measurement apparatus and power supply supplied with the apparatus will depend upon the material to be tested and the test standard to be complied with. A few examples (by no means exhaustive) of test cells which can be supplied are shown in the photos below.

ELECTROSTATIC PROPERTIES DETERMINATION



Concentric rings test electrode - in compliance with standards listed above.



Textile fabric tester to DIN 54345 Part 5. Tests electrical resistance of strips of textile fabric.

Spark Incendivity Probe and Gas Mixing

Chilworth manufacture a gas ignition probe to enable static discharges to be drawn from a surface through a gas mixture of known ignition energy. This is a means of estimating discharge energy in a way that is extremely demonstrative and practical. A gas mixing unit and calibration table is provided with the ignition probe and covers a wide range of gases.

An optional spark ignition calibration unit is also available which permits the operator to calibrate the probe to a gas of known Minimum Ignition Energy.



Gas probe & mixing equipment for estimation of discharge energy drawn from surfaces. Spark ignition calibration unit not shown (optional extra).

ON PLANT TESTING

Electrostatic Field Meter (JCI 140) NEW

A compact and easy to use instrument for detection and measurement of static electricity in practical situations. This instrument measures surface voltages without contact at a separation distance of 100mm. Full scale sensitivities are 2000 volts and 20,000 volts and measurements can be made to 1V on the 2000V scale. Connections for long term continuous monitoring operation and for signal recording.



Electrostatic fieldmeter (JCI 140) for non-contact measurement of surface charge.

Floor, Footwear & Glove Testing REVISED

Permits testing in accordance with BS5958 and results to be compared to the guidelines mentioned within CENELEC CLC/TR 50404:2003. Consists of floor electrodes, high resistance range insulation tester, hand electrode, foot plate, insulated backing sheet, calibration resistors and test guidance manual, all located within a convenient carry/storage case.



Floor, Footwear & Glove Testing Equipment

Spark Detection REVISED

A field study tool manufactured for remote detection of electrostatic spark activity on plant using radio frequency monitoring principles.



Spark Detection Equipment

Static Electricity Neutraliser NEW

Chilworth can also supply electrostatic neutralisers and power supply equipment for solving clients on-site electrostatic hazards or to provide a solution to production problems caused by electrostatics.

We can provide off-the-shelf or custom fabricated solutions.



Static Electricity Neutraliser (Power supply and air line not shown.)



A separate PDF information sheets is available for the Humidity Controlled Workstation.

EXPLOSIVE PROPERTIES DETERMINATION

Instruments to determine the explosive properties and sensitivity to mechanical stimulation of potentially highly energetic materials. This information is required for in-house process safety screening and for the notification and transportation purposes.

BAM Fallhammer

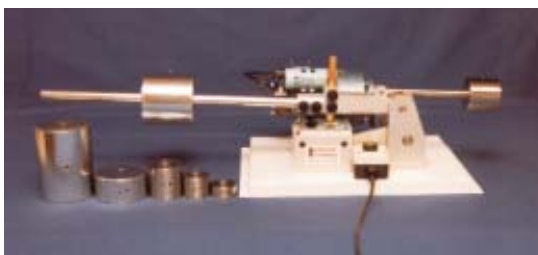
To study the impact sensitivity of solids and liquids. Designed and manufactured to permit testing to the UN Transport of Dangerous Goods recommendations, Manual of Tests and Criteria, UN Test 3(a)ii and to the European Classification, Packaging and Labelling of Dangerous Substances in the European Union - Part 2 Testing methods guidelines Test A14.



BAM Fallhammer Apparatus

BAM Friction

To examine the sensitivity of solids and pastes to sliding (frictional) contact. Designed and manufactured to permit testing to the UN Transport of Dangerous Goods recommendations, Manual of Tests and Criteria, UN Test 3(b)i and to the European Classification, Packaging and Labelling of Dangerous Substances in the European Union - Part 2 Testing methods guidelines Test A14.



BAM Friction Apparatus

Koenen Tube

To study the reaction of solids and liquids to intense heating under partial confinement. Designed and manufactured to permit testing to the UN Transport of Dangerous Goods recommendations, Manual of Tests and Criteria, UN Test E.1 and to the European Classification, Packaging and Labelling of Dangerous Substances in the European Union - Part 2 Testing methods guidelines Test A14.



Koenen Tube Apparatus

Rotary Friction

NEW

The Rotary Friction Test is used to measure the sensitivity of solid substances to mechanical frictional stimuli and to determine if the substance is too dangerous to transport in the form tested.

The apparatus permits testing in accordance with the UN Transport of Dangerous Goods recommendations, Manual of Tests and Criteria.



Rotary Friction Test Apparatus

Time Pressure

The Time/Pressure test apparatus is used to examine the effect of an ignition on substances under confinement and, in particular, the possibility that ignition might lead to decomposition with explosive violence at pressures which can be attained with substances in normal commercial packages.

The apparatus supplied permits testing to the current UN Transport of Dangerous Goods recommendations Test C1 and European Union regulations.



Time Pressure Test Vessel (Can also be used for oxidising liquids tests - see page 6.)

CUSTOM PROJECTS

Laboratory Managers are often asked to source equipment for specific in-house research. The equipment required could well be related to an idea or concept that has been conceived within the company but for which there are no off-the-shelf solutions for the provision of test data. This is where Chilworth's instrument expertise can help, providing design, fabrication and supply to an agreed budget and timetable. Examples of recent projects are highlighted below.

1m³ Spherical Explosion Vessel

The client needed to obtain maximum explosion pressure and maximum explosion rate of pressure rise data of various powders dispersed and ignited within a 1m³ spherical vessel. The vessel must be able to withstand high pressure to a maximum of 225 bara @ 100°C.

Solution: Chilworth designed and manufactured the vessel, dispersion and firing electronics required in order to carry out these tests. A high speed data control and acquisition system was also provided with the system. This equipment allows testing in accordance with BS 6713: Part 1: 1986, ISO 6184/1-1985 and PrEN 14034: Parts 1 and 2.



1m³ Spherical Vessel

Capacitive Spark Discharge inside a 20 Litre Sphere

The client wished to produce capacitive spark discharges within a 20 litre sphere as an alternative ignition source to chemical ignitors.

Solution: Chilworth used their Minimum Ignition Energy apparatus as the spark source and integrated a high voltage switching system into the standard apparatus. The capacitive discharges were achieved by interfacing the KSEP 310 igniter firing signal of the 20 litre apparatus with a custom fabricated trigger unit. This in turn activated a capacitive spark discharge across an adjustable spark gap incorporated within the same ignition electrodes normally fitted to a 20 litre sphere.



Capacitive spark generator for use with a 20 litre sphere apparatus.

Pharmaceutical Powder Screening

The client required a small scale laboratory test apparatus which could screen their manufactured pharmaceutical products for magnitude of explosion effects (i.e maximum pressure and maximum rate of pressure rise) when ignited as a dust cloud. They also had insufficient powders available for 20ltr sphere testing.

Solution: A Hartmann Bomb apparatus based on a 1.2 litre volume Hartmann tube. Whilst realising that the Hartmann Bomb data must not be applied to Process Plant as a basis for safety, the benefit of this apparatus was that only a very small quantity of sample was required for each test.

Because the client wished to make maximum pressure rate comparisons between their various manufactured products, the equipment supplied provided a very useful screening tool. A high speed data acquisition software

and hardware solution was provided together with the dispersion and igniter firing electronics.



Hartmann Bomb Apparatus

Waste Stream Screening

The client required apparatus which could effectively screen waste streams for exothermic activity prior to mixing and storing. Waste Streams are often mixed and stored prior to incineration. The mixing and/or storage of incompatible products could result in the storage tank in question venting to atmosphere or suffering catastrophic failure.

Solution: Chilworth designed and manufactured a robust waste stream screening calorimeter for mixing and analysing waste samples taken from an on-site tank and incoming road tanker. The equipment consisted of a mixing tank, dosing vessel with internal heater, agitator, and relief system. Full automated operation was included comprising a custom written software program which also recorded the short duration screening test required.



Waste Stream Screening Calorimeter



CONTACTS

UK

Chilworth Technology Ltd.
Beta House, Chilworth Science Park,
Southampton, Hants., SO16 7NS UK
Tel: +44 (0)23 8076 0722
Fax: +44 (0)23 8076 7866
Email: info@chilworth.co.uk
Web: www.chilworth.co.uk

USA

Chilworth Technology Inc.
250 Plainsboro Road, Bldg #7,
Plainsboro, NJ 08536 USA
Tel: +1 609-799-4449
Fax: +1 609-799-5559
Email: marketing@chilworth.com
Web: www.chilworth.com

Italy

Chilworth Vassallo Srl
Via Manzoni, 25
23868 Valmadrera - LC, ITALY
Tel: +39 0341 200023
Fax: +39 0341 201240
Email: info@chilworth.it
Web: www.chilworth.it

France

Chilworth SARL
10 Allée des charmillles,
69360, Serezin, FRANCE
Tel/Fax: +33 4 78 02 01 94
Email: jmfrancois@chilworth.co.uk

India

Chilworth Safety
& Risk Management (Pvt.) Ltd.
Email: info@chilworth.co.in
Web: www.chilworth.co.in

Mumbai Office:

D-8/12, Rishabh Complex,
Opposite Fun Republic, Off Link Rd.,
Andheri - West,
Mumbai - 400053, INDIA
Tel: +91 22 5694 2350
Fax: +91 22 5694 2352

Delhi Office:

C6, 6164 Vashant Kunj
New Delhi - 110070, INDIA
Tel: +91 11 5566 1496
Fax: +91 11 2613 6979

CHILWORTH CUSTOMER SUPPORT

Warranty

Full 12 month warranties are supplied with all equipment.

Training

On-site and off-site training is available for all equipment, to ensure your staff can operate safely, competently and in accordance with set standards and protocols. More formal training on the broader aspects of process safety can also be arranged.

Calibration & Maintenance

Contracts for repairs, maintenance, calibration and certification for various quality programmes (e.g. Good Laboratory Practice) can be provided.

Test Standards

Where relevant, all our equipment is designed to comply with national (e.g. BS, ASTM) or international (e.g. ISO, CEN, CENELEC) standards.

WEB SITE SUPPORT - www.chilworth.co.uk

See the instruments section of our web site for further leaflets and information on our range of instrumentation for process safety laboratories:-



Other Chilworth services include :-

- Dust/gas/vapour Explosion Testing
- Electrostatic Properties
- HAC
- Chemical Reaction Hazards
- Regulatory Testing
- ATEX/DSEAR Audits
- Major Hazards
- HAZOP
- Incident Investigation
- Expert Witness
- Risk Management
- Loss Prevention
- Process Design
- Process Safety Training