

James Walker

Sealing the IPPC

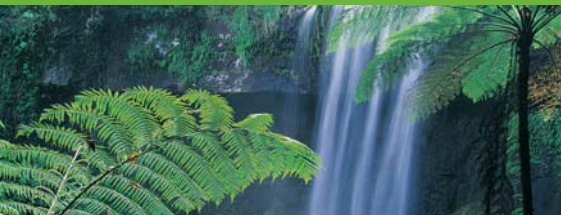


How James Walker can help your business

A guide to the EU Integrated Pollution
Prevention and Control Directive



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Section 1

James Walker Group



The James Walker Group is a dynamic global manufacturing organisation supplying high performance sealing, bolting and rail solutions to key market sectors including oil and gas, refining, chemicals, pharmaceuticals, power generation, transport and defence.

About James Walker

James Walker provides extensive polymer and metal engineering expertise backed by more than 50 production, engineering, distribution and client support facilities around the world. Critical disciplines are organised into international Centres of Excellence which can work together to provide highly sophisticated integrated solutions.

The Group has extensive Research and Development facilities which investigate, assess and develop the potential of a wide range of new materials and systems, often in conjunction with blue chip clients.

Operators have to ensure that their IPPC directive responsibilities are met, and substantial penalties apply for non-compliance.

James Walker's experience and knowledge, allied to our range of leading edge products and services, makes us the ideal partner to help you comply with the IPPC directive.

The EU Integrated Pollution Prevention and Control (IPPC) regulations - an overview



The IPPC Directive 96/61/EC was adopted in September 1996, became law in October 1999 and will be fully implemented for all existing plants by 2007.

This is the first single environmental legislation which takes an integrated approach on emissions including noise, vibration and heat, energy efficiency, water efficiency, waste production, land contamination, emergency preparedness, accident prevention and management systems, in addition to emissions to the environment.

Another innovation is the introduction of the concept of BAT (Best Available Techniques). BAT can apply to either a product or service. Applicants and regulators have to assess what technology is used and how their current systems and procedures impact on environmental protection.

Companies will be obliged to use BAT, but to do that, information on new technologies and techniques needs to be established.

The Commission has undertaken to publish the results of the information exchange every three years in the form of BAT reference documents, each known as a BREF. An IPPC bureau has been established in Seville to set up an information management system for these documents. The latest BAT and BREF information can be found at the European IPPC Bureau website: <http://eippcb.jrc.es>.

BREF documents are available, or are being drafted, for all major industries. A good deal of initial work is likely to focus on the reduction of releases to atmosphere of Volatile Organic Compounds (VOCs) by way of fugitive emissions as outlined in the BREF documents for the Mineral Oil and Gas Refineries and the Large Volume Organic Chemical Industry. You can find a list of useful contacts in the Appendix.

The IPPC regulations apply to a wide range of sectors including, but not limited to, energy, metals, waste management, chemicals, farming, textiles and food production.

James Walker is an active member of the European Sealing Association and we have made a significant contribution to the Association's 'Sealing Technology BAT Guidance Notes'. This document, which is available for free download from the ESA website, gives the industry consensus guidance on Best Available Techniques for sealing; bolted flange connections, rotodynamic equipment, reciprocating shafts and valves.

? How do the regulations apply to new and existing installations?

Since October 1999, the Directive has applied to all new installations, as well as existing installations where changes are planned which may have significant negative effects on people or the environment.

The Directive does not immediately apply to other existing installations. These were granted an additional eight years of grace, with a deadline of October 2007. Some EU countries already have BAT-based permitting systems for this category.

You can find out what BAT-based permits and permitting systems are available in the member countries by contacting your local regulatory authority.

? What do I have to do to obtain permits?

Your organisation will have to prepare and present a detailed permit application to the appropriate regulatory authorities to start the process.

Your application must fully describe the way your organisation operates and controls its process and whether or not it meets the requirements of BAT.

There are three categories of installation regulated:

Part A1 - Installations with the greatest potential for causing damage to the environment. These are regulated by the relevant national authority.

Part A2 - Installations with less potential for causing damage to the environment. These are regulated by the relevant local authority.

Part B - Installations with a limited risk associated with causing damage to the environment. These are regulated (for emissions to air only) by the relevant local authority.

Your application will be used by the regulatory authority to prepare an IPPC permit, which will state how your organisation's process must operate, and what improvements you may need to make.

Making your IPPC applications

Permits are required prior to the operation of a new installation, or to keep an existing installation running.

When you apply for a permit, you must:

- Consider all environmental impacts associated with the installation, including a thorough review of site activities and procedures, as well as providing justification where activities do not conform to BAT
- Agree an ongoing improvement programme, designed to improve environmental performance
- Submit the application within the specific time 'window' determined by the industry sector
- Advertise the application in specific publications

The regulating authority will:

- Place a copy of the application on a public register, held in the local office of the relevant national authority, and the local authority, which the public is free to view
- Undertake a public consultation, as well as consultation with a number of statutory consultees

Once the consultation period is over, the regulatory authority will consider all the representations reviewed, and will either grant the permit subject to conditions, or reject the application. If you are dissatisfied with a decision, you can appeal to the appropriate government authority.

After your application

Once a permit has been granted, you will be responsible for operating within the specific requirement of the permit and demonstrating that emissions do not fall outside the specified limits. Reports have to be submitted to the regulators, at agreed time intervals.

This means that, as an operator, you will have to:

- Monitor emissions
- Supply the regulator with the data required to check compliance with the permit
- Undertake ongoing improvements, as agreed within the site improvement plan
- Ensure compliance with any conditions as set by the regulator

In addition, the regulator has to undertake independent monitoring and inspections of your installation to check compliance with the set emission limits.

Non-Compliance with conditions

In situations where the regulator believes the operator is failing to meet with the requirements of the permit, enforcement options are available including:

- Enforcement notice
- Suspension notice
- Revocation notice

The operator can appeal against any revocation notice to the appropriate government authority.

If necessary, regulators have been given powers to prosecute operators who contravene requirements or provide misleading information. Penalties range from fines to imprisonment, although there may be variations from country to country.

Section 2

How James Walker can help



Introduction

With respect to the IPPC Directive, James Walker's great strength is the provision of world-beating solutions to control and eliminate VOC emissions, particularly in refineries, petrochemical, chemical and other areas of the process industries.

VOC is the generic term applied to all compounds containing organic carbon, which evaporate at ambient temperature and contribute to the formation of 'summer smog' and odour nuisance.

As a world leader in sealing solutions, we have an in depth understanding of the latest sealing technologies and products and can confirm whether the sealing systems you have, or are planning to install, meets your IPPC emissions containment targets.

We also have a range of highly professional services including plant maintenance and repair and our new Joint Integrity Programme which includes a comprehensive leak detection and repair service for VOCs.

James Walker products

We have an extensive range of world-class products and services which meet or exceed the requirements of many international standards, including the requirements of the German 'TA-Luft'.

Compression packings for valves

Equipment leaks from valve glands are considered to account for approximately 50-60% of the fugitive emissions on petrochemical sites. Furthermore, the major proportion of fugitive emissions comes from only a small fraction of the sources. For example, less than 5% of valves in gas / vapour service can account for more than 90% of the fugitive emissions in a refinery.

James Walker offers two products - Supagraf® Premier and Supagraf® Control - which were specifically developed through intensive research programmes to combat fugitive VOC emissions from valves.



Supagraf® Premier – world-beating fugitive emission control for block valves

- Fugitive emission control to well below 100ppm
- Certified to TA-Luft requirements
- Low friction on rotary and rising stem valves
- Maximum system pressure: typically 210bar
- Has been tested in a valve in accordance with Shell spec SPE77/312 and achieved class A tightness
- Top of its class in independent tests run on behalf of the CAPI Group (Akzo Nobel, Shell, Dow and DSM)



Supagraf® Control – for control valves – high cycle duty sealing with good fugitive emission control

- High integrity gland sealing for control valves
- Reduces fugitive emissions to below 50ppm to help industry meet EU IPPC Directive
- Certified to TA-Luft requirements
- Long-term, adjustment-free operation - over 100,000 valve strokes
- Low friction graphite for accurate valve action
- Maximum system pressure: typically 210bar
- Has been tested in a control valve to the requirements of ISO 15848-1 and achieved class B tightness levels over 100,000 cycles



Flange Gaskets & Sheet Jointings

A significant majority of VOC fugitive emissions come from petrochemical process equipment. In addition to a wide range of quality sheet gasket materials such as compressed fibre and expanded graphite, James Walker also offers four world-beating solutions - Metakamm® Kammprofile, Metaflex® spiral wound gaskets, Metcom® and a range of WL Gore & Associates PTFE gasket products. A range of sheet jointing materials, including expanded graphite, is also available.

Metakamm® Kammprofile

Our Metakamm Kammprofile gaskets are now widely specified for high temperature/pressure pipework, heat exchangers and other pressure vessels where spiral wound gaskets were previously used. The structure involves a robust metal core with a soft layer of sealing material bonded to concentric grooves on either side. These are easier to handle at large diameters, whereas rough handling can often cause a large diameter spiral-wound gasket to spring apart.

Prime features

- Accommodate a vast range of operating conditions including line temperatures up to 1000°C and pressures typically up to around 250bar
- Used on vessels such as heat exchangers where thermal cycling exists, and where joints need to be made quite rigid for best results
- Undamaged cores can often be fitted with new soft faces to reduce maintenance costs
- Certified as meeting TA-Luft emission control requirements
- Manufactured to suit all relevant flange standards including ASME B16.5, BS1560, ASME B16.47 Series A (MSS-SP44), ASME B16.47 Series B (API605), BS EN 1092 (BS4504); plus DIN, JIS and NF

Metaflex®

Typically Metaflex spiral wound gaskets are used on pipelines and pressure vessels on steam, petrochemical, nuclear, marine and hydraulic plant, and heat exchangers.

Metaflex gaskets are manufactured from V-shaped metal strips, spirally wound with an inlay of filler between each turn. Support rings, inside and/or outside the spiral, improve the gasket's handling, fitting and versatility. This arrangement is highly successful on flanges where temperature, pressure, vibration or flow rates are beyond the capability of conventional jointing materials.

Prime features

- A wide variety of sizes and shapes
- Combinations of metal strip and filler are selected to suit the specific fluid media and operating conditions
- Quick to install and remove

- Operating temperatures from cryogenic up to 1000°C
- Ability to cope with thermal cycling conditions
- System pressures from high vacuum to over 350bar
- Support rings - inside and/or outside the spiral - make gaskets suitable for high pipeline pressures on flat or raised flange faces
- Certified as meeting TA-Luft emission control requirements
- Manufactured in accordance with all relevant gasket standards to suit flange designations: ASME B16.5, BS1560, ASME B16.47 Series A (MSS-SP44), ASME B16.47 Series B (API605), BS EN 1092 (BS4504); plus DIN, JIS and NF

Metcom® gaskets

Self-locating Metcom® gaskets are suitable for high temperatures and pressure applications, and are particularly effective when used to replace thinner pipe joints used in petrochemicals liquid or gas production and transportation.

Prime features

- Thin corrugated steel with concentric grooves
- Grooves filled with expanded graphite
- Lug design for easy fitting with self-location. The multi-fit lug design means a reduced inventory as one size fits several flange classes
- Thinner than a spiral wound gasket, when replacing compressed fibre gaskets used previously
- Certified to TA-Luft requirements

GORE® Universal Pipe Gaskets

GORE® Universal Pipe Gaskets (Style 800) are used to seal all types of flanges in chemical process piping. Designed to meet the needs of many different piping materials, they are ideal for standardising gasket material across the steel, glass-lined steel and FRP systems, whenever a non-metallic gasket can be used. GORE® Universal Pipe Gaskets meet TA-Luft requirements.

Other Jointing Materials

In addition to its range of gaskets, James Walker offers a complete range of sheet jointing materials, including expanded graphite.



Bolted Joints

Ensuring joint tightness

Conventional bolt tightening methods often leave a lot to be desired. Relying on torque means that the relationship between tightening power and achieved tension in the fastener has to be estimated, as the frictional properties on the threads and washers cannot be guaranteed.

Similarly, devices such as hydraulic tensioners use an estimated degree of overload to try and compensate for compliance in the system when these tensioners are de-pressurised.

The only way to ensure that joints are installed to the optimum loading is to have a way of actually measuring the installed fastener tension load with some degree of accuracy.

Tension control is critical to the reliability and safety of bolted joints. Traditional tightening methods measure the secondary factors of torque or hydraulic pressure - they do not measure the key factor-tension! RotaBolt® delivers tension control at installation and throughout the life of the bolted joint, providing simple, accurate and continuous verification of pressure on the gasket.



RotaBolt® tension control fasteners

The James Walker RotaBolt range of tension monitoring systems and unrivalled technical expertise has established the company as a global centre of excellence for bolting technology. We provide solutions across a wide range of industries including oil and gas, chemical processing, power generation, civil engineering, environment, transport and defence.

Incorporating RotaBolt technology into product design delivers significant benefits from health & safety and environmental perspectives. The accuracy of gasket pressure control made possible by RotaBolt technology has been shown again and again to deliver cost savings through reduced maintenance and down time. The installation of gaskets combined with RotaBolts is now playing an important role in maintaining operational reliability across a vast range of industries.



RotaBolt® 1

The RotaBolt® tension sensor design has been proven in the most arduous of applications for over 25 years. Every RotaBolt is 100% load test calibrated to an accuracy of 5% on tension. Standard bolts are converted by inserting the RotaBolt indicator. Component materials are compatible with the parent bolt to nullify in-service thermal and galvanic effects.

Before bolt installation, the special rotacap spins freely. As the bolt is tightened, it stretches elastically and the rotacap locks at the specified calibrated tension value. If tension reduces for any reason, the rotacap immediately rotates freely to give a clear indication of tension loss.

RotaBolt® 2

RotaBolt® 2 provides an additional tension control on installation tightening and in-service checking, by offering two tension settings in a single sensor. A dual load indicator cap - the outer cap for high-tension setting and the inner cap for low tension - gives the choice of an operational tension range, either for overload or maintenance control.



RotaBolt® Vision

RotaBolt® Vision is the world's first safety bolt to give a clear, visual indication of loss of tension across the bolted joint. It operates on the same internal air-gap sensor technology as RotaBolt® 1, but instead of a tactile, fingertip indicator, RotaBolt Vision has a specially developed visual indicator which appears as an unbroken yellow line across the head of the bolt.

As soon as tension is lost across the bolt, the indicator instantly rotates by ninety degrees to show a distinct right angle break in the yellow line. This is clearly visible up to 25 metres away.

Support Services

Joint Integrity Programme

The James Walker Joint Integrity Programme has been developed to support asset managers by offering an integrated and engineered approach to the provision of advanced sealing solutions.

Old equipment is updated or replaced and new equipment added to keep pace with changing market conditions and the demands of environmental legislation.

Frequently, the result is a tangle of pipe-work and equipment from different manufacturers – and even different eras - bolted together. For an asset manager, ensuring all of these bolted joints remain intact and leak-free can be a nightmare.

Bolted joints are sometimes a low priority when it comes to maintenance planning. The focus of most maintenance schedules is on the large – and expensive - equipment on site. It is only when there is a failure and expensive product is pouring down the drain that the value of joint integrity is really appreciated.

The purpose of our Joint Integrity Programme is to re-align that focus, by drawing on the combined expertise of all the companies within the James Walker Group, from bolting through to gasketing and project management.

To support the programme, we have entered into a series of strategic alliances which will provide specific benefits to our clients.

The Joint Integrity Programme approach - **Evaluate, Design and Apply** - is aimed at delivering long-term solutions where the cost benefits speak for themselves, as opposed to short-term fixes that need to be applied again and again, at considerable cost.

We recognise that no one solution will be applicable to everyone. The Joint Integrity Programme is made up of a series of modules that can be tailored to suit each individual client's needs and requirements. Some of these modules are outlined below.

- Leak Detection and Repair (LDAR) for vessels handling volatile organic compounds
- Tagging, data management and reporting
- Heat exchanger and pressure vessel bolted joint programme

Clients can choose a single service or a combination of services to best meet their needs.

LDAR (Leak Detection and Repair)

Our LDAR service combats fugitive VOC emissions at oil, gas and chemical sites. We monitor all piping components, flange joints and valves to EPA Method 21, then record and track VOC emissions. We can assist in scheduling repairs and carry out maintenance or refurbishment work. We then undertake regular site audits to ensure the lowest possible emission levels.

There are many additional benefits associated with our LDAR programme. For example, LDAR assists with environmental reporting and also interfaces with your general maintenance activities.

LDAR will:

- Reduce your operating costs
- Stem your loss of valuable products
- Improve your environmental performance
- Enhance the safety of your on-site operatives



Data management and reporting

A crucial part of the James Walker service is the collection of data from the client's site which can then be used to produce reports which support their IPPC application and their business in general.

Heat exchangers and pressure vessels

Heat exchangers and pressure vessels carry a high risk of VOC leaks. We will evaluate, report, and provide an engineered solution, which can include analysis, on-site measurement, machining, dismantling, the installation of products and components and ongoing, on-site support. By choosing a tailored solution, you increase production levels, reduce downtime and cut maintenance costs.





Plant maintenance & refurbishment

James Walker companies also supply industry worldwide with professional plant maintenance and refurbishment services that go well beyond the accepted norms in terms of advice and planning, the quality of on-site and off-site workmanship and the standards of safety and care.

Our on-site maintenance capabilities include the overhaul of plant, such as pumps, valves, mixers, hydraulic equipment and flange joints, together with the replacement of expansion joints and bellows.

We refurbish any model of industrial valve, pump, hydraulic cylinder or mechanical seal at our dedicated workshops. Another James Walker speciality is the overall re-engineering of sealing systems, where we provide metalwork conversions for rotary equipment to facilitate improvements and accommodate new seal designs.

In conclusion

James Walker has the products, expertise and integrated sealing solutions to save you time and money when preparing, or responding to, IPPC applications.

In addition to helping you achieve IPPC certification, James Walker products and services can help cut equipment leaks dramatically and achieve efficiencies through reduced power consumption, better use of energy, improved water usage and better plant performance.

James Walker repair and maintenance services can ensure ongoing IPPC compliance and the effective and efficient operation of your plant.

In essence, the James Walker mission is to prevent pollution of the environment through a range of products and services which are environmentally friendly and which generate major benefits for your business.

Typical scenario

On more than one occasion, James Walker has been presented with a leaking pressure vessel in hydrocarbon service, where there has been a risk of fire due to the escape of hot VOC products. In such cases a 'steam quench' is used to surround the flange to flush the vapours out of the atmosphere to try and mitigate the obvious risks. By using good bolted joint technology, quality gaskets and accurate loading with RotaBolts, these joints have remained leak-free, giving the following advantages:

- Reduced VOC product losses, hence reduced lost product cost and improved environmental performance
- Reduced water consumption by reducing the need for the steam quench
- Reduced power consumption and costs by removing the need to generate steam for the steam quench
- A safer working environment for the plant operators
- Removal of the need to apply short-term, costly, repetitive maintenance work

Case study

Engineers at a large urea plant in New Zealand had struggled to curb leakage from a flange for no less than 10 years before our local operation finally solved the problem. The particular joint was the dome flange on a high-pressure decomposer reboiler lid. Despite the engineers' best efforts, this flange leaked continuously, even after shutdowns when the joint had not been broken.

The hazardous nature of the product - urea carbamate solution at 185°C - eliminated any prospect of re-tensioning the bolts while the plant was operational. After discussions with the site engineers, our gasket experts checked the flange gasket calculations and devised a solution - a PTFE-faced Metakamm® gasket from the James Walker Moorflex range, combined with 36 RotaBolt-controlled tension studs.

After these had been installed and correctly tensioned, the joint was monitored. It was discovered that the gasket relaxed after 12 hours at ambient temperature; something the plant engineers hadn't previously taken into account. Spotting this change in joint integrity was made simple by the RotaBolts which immediately reacted to the altered tension.

It was then only a matter of re-tensioning each RotaBolt® to solve, in a matter of hours, a problem that had baffled engineers for a decade. Since the new joint was made, the previously troublesome vessel has been opened up no less than four times for cleaning, with no signs of leakage when the process has been re-started.

Section 3

Appendix



What is the IPPC?

Published 1996, the Integrated Pollution Prevention and Control (IPPC) Directive is about a common set of rules to minimise pollution from various sources throughout the European Union.

All installations covered by Annex I of the Directive have to obtain an authorisation, or permit, from the national environmental protection agencies in the various EU countries. Unless the installations have a permit, they will not be allowed to operate. The permits must be based on the concept of Best Available Techniques (or BAT), which is defined in Article 2 of the Directive.

In many cases, BAT involves radical environmental improvements and these could be very costly for companies to implement. To impose new and considerably tougher BAT rules on all existing installations in the EU could jeopardise many European jobs, and, consequently, the Directive has granted these installations a reasonable transition period, starting from the day the Directive came into force to allow larger improvement projects to be undertaken.



Why is the IPPC important?

Current European production and consumption patterns are certainly not sustainable. In recent decades, industry has made tremendous improvements to reduce the impact of a number of major polluting substances. The emphasis has now shifted towards so-called 'diffuse' sources of pollution,

such as traffic and household chemicals.

Nevertheless, industrial production processes still account for a considerable share of the overall pollution in Europe, particularly pollutants such as greenhouse gases, acidifying substances, volatile organic compounds and waste. So it is important that their contribution to 'unsustainability' is reduced.

Besides, it is much easier to change the production patterns of twenty thousand companies than it is to change the consumption patterns of hundreds of millions of EU citizens. Another reason for having uniform EU permitting rules is to avoid environmental dumping, where companies move from one part of the EU to another where environmental requirements are less strict.



Is the IPPC now in force?

The 15 'old' EU member states had until the end of October 1999 to adjust their national legislation in line with the Directive. The ten 'new' member states had to do this by the date of accession, 1 May 2004. Several 'old' member states were very late, but by May 2004, all 25 member states had fulfilled this basic obligation. However, some still have incomplete legislation that needs to be improved.

Since October 1999, the Directive has applied to all new installations, as well as existing installations that intend to carry out changes that may have significant negative effects on people, or the environment.

The Directive did not immediately apply to other existing installations. These have been granted an additional eight years of grace.

However, some EU countries already have BAT-based permitting systems for this category.

On the EU level, Directive 84/360 from 1984 also provides for BAT-based permitting, although it only regards emissions to air and is relevant to a more limited number of installations.



Which countries are affected by the IPPC?

Identical rules apply to all 15 'old' EU countries. Four 'new' member states - Poland, Slovenia, Slovakia and Latvia - have received an extra transition period in which to meet the BAT requirements in specific existing installations. Bulgaria has also been granted certain transition periods and Romania has requested this too.



How does the IPPC work in practice?

The EU has laid down basic rules for integrated permits. 'Integrated' means that the permits must take into account the whole environmental performance of the plant, including emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents and risk management.

Since the permits must be based on BAT, the licensing authorities need some help to find out which techniques are BAT. Annex IV of the Directive contains issues to be taken into account when determining BAT.

The European Commission also organises an exchange of information between experts from

EU member states, industry and environmental organisations. This is coordinated by the European IPPC Bureau and has been divided into 30 sectors along the lines of Annex I of the Directive.

It takes around two years to complete the work for each sector and produce a BAT reference document (BREF). The most up-to-date versions of BREFs can be downloaded from the European IPPC Bureau website, <http://eippcb.jrc.es>, and are also available on CD.

While the BREFs are intended to help the licensing authorities, the final decision should still lie with these authorities, because Article 9 of the Directive establishes that they must take into account:

- The technical characteristics of the installation
- Its geographical location
- Local environmental conditions

This decentralised approach is counterbalanced by the fact that, according to Article 18 of the Directive, there are cases where common and fixed EU emission limit values are justified.

It has also been decided that policy-makers and the public at large need better information about the amount of pollution produced by different installations. Consequently, the Directive provides for the setting up of a European Pollutant Emission Register (EPER).

The major players

The major players involved in IPPC activities are:

- The national, regional or local licensing authorities in the 15 'old' EU countries, which issue BAT-based permits
- The European Commission and, in particular, the Environment Directorate-General and its unit G.2 (Industry) who make sure the 15 member states apply the Directive as intended
- The member states' experts who participate in the exchange of BAT information. They come from national environmental protection agencies, or similar organisations
- The industry experts who participate in the exchange of BAT information
- The environmental organisations that participate in the exchange of BAT information
- The Information Exchange Forum, which, together with the European Commission, organises the exchange of information on BAT. Together they are made up of representatives of EU Member States, industry, environmental organisations and the European Commission
- The European IPPC Bureau at the EU Joint Research Centre in Seville
- The IPPC Experts Group and the IMPEL network. These are forums for discussion between national authorities on issues linked to the implementation and enforcement of the Directive
- The public. According to Article 15 of the Directive, the public shall have access to (a) permit applications, (b) permits, (c) monitoring reports and (d) the EPER. BREFs are also publicly available on the European IPPC Bureau website. The active participation of the public is essential to drive industrial environmental performance forward. Directive 2003/35/EC further strengthens the rights of the public in the context of permitting procedures

Useful contacts

European IPPC Bureau website: <http://eippcb.jrc.es>

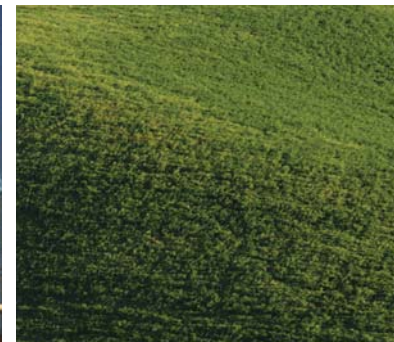
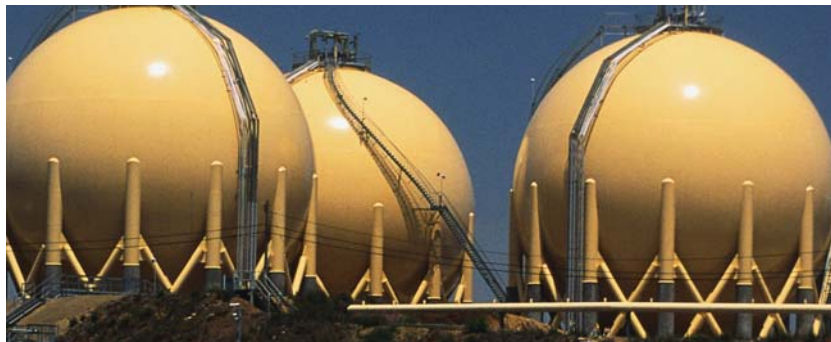
ESA website: www.europeansealing.com

Information

This booklet is given for information purposes only. Whilst we have taken every care to ensure that the information contained in this booklet is accurate and up to date, you should always obtain specific and expert advice before taking or refraining from taking any action. We will not accept any liability whatsoever for any losses, damage or injury whether financial or otherwise which any person may suffer as the result of acting or refraining from acting solely on the basis of the information contained in this booklet.

Health warning: If PTFE or fluorocarbon (FKM) products are heated to elevated temperatures, fumes will be produced which may give unpleasant effects, if inhaled. Whilst some fumes are emitted below 250°C from fluorocarbons or below 300°C from PTFE, the effect at these temperatures is negligible. Care should be taken to avoid contaminating tobacco with particles of fluorocarbon or PTFE or with PTFE dispersion, which may remain on hands or clothing. Material Safety Data Sheets (MSDS) are available on request.

Information in this publication and otherwise supplied to users is based on our general experience and is given in good faith, but because of factors which are outside our knowledge and control and effect the use of products, no warranty is given or is to be implied with respect to such information. Specifications are subject to change without notice. Statements of operating limits quoted in this publication are not an indication that these values can be applied simultaneously.



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