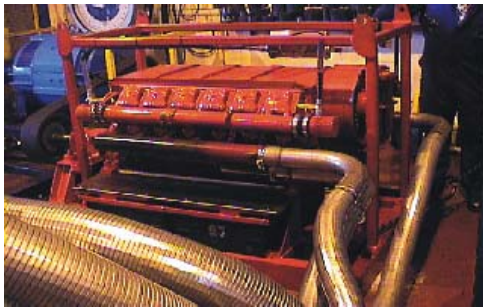


The use of diesel engines in hazardous areas is diverse and widespread and includes vehicles, generators and lifting equipment. Whilst electrically powered equivalents provide an alternative, they often lack the power and flexibility of the diesel engine. However, diesels have a number of obvious drawbacks including noise, exhaust emissions and ignition potential.

Until recently, each country within the EU regarded diesel machines differently and imposed their own regulations, some more onerous than others. For example, some countries insist on exhaust flametraps and others do not. Emission limits may vary meaning different pump settings. This has the unfortunate drawback that a machine approved for use in one country could not necessarily be used in another without re-testing and modification.



Machines sold within the EU are now required to be CE marked. By marking the equipment, the manufacturer is attesting to the fact that it meets all the mandatory EU Directives relating to it. However, it is not always obvious which, if any, of these Directives apply. To further complicate matters, the Directives are generally broad-brush documents but often require regard to 'due technical knowledge'. This is the legal term for compliance with the current standards. In many cases, fully adopted European Standards are not available for specific types of equipment or for innovative designs. In such cases, the Directives allow for reference to National, International (such as IEC) or recognised industry standards.

So which of the Directives and Standards apply and to which parts of the machine when it is put into service?

General Safety

The vehicle as a whole, with the engine fitted, is regarded as a 'machine' and therefore the requirements of 98/37/EC 'Machinery Directive' apply. The basis for mobile machines as a whole is prEN 1889 and the safety of the engine itself is EN 1679-1:1999. The original engine manufacturer must declare compliance with these requirements before placing the machine on the market. These standards and Directives cover the general construction, such that the integrity of the machine is maintained and risks from general use are minimised. Original equipment engines and ancillaries are subsequently modified for use in hazardous areas.

The explosion risk

Explosion risks are addressed by compliance with 94/9/EC – the 'ATEX' Directive. Unlike surface industry applications which treat dust and gas build-ups differently, mining environments are considered as a unique case and take into account the explosion risk from methane and coal dust in the same documents.

Risks from the engine are considered by compliance with EN 1834-2:1999 and EN 1127-1:1999. Tests and assessments are carried out to address the different potential sources of ignition and either prevent them occurring, or limit their impact. Examples of ignition potential are frictional contact, excessive temperatures and the emission of sparks and flames from either the exhaust or inlet. The risk from other ignition sources, such as optical or acoustic radiation are generally considered to be negligible.

The explosion risk from ancillary electrical equipment, such as alternator systems, starters or electronic management systems are again covered by the ATEX Directive, with reference to the EN 50014 series of standards. This utilises the familiar concepts of flameproof enclosure (Ex d), Intrinsically safe circuitry (Ex i) and the like. Most engine modifiers purchase compliant proprietary equipment in this respect.



The explosion risk from mechanical parts of the machine is addressed by the EN 13463 range of standards. An entirely new raft of standards is being developed to address mechanical hazards and introduces new protection concepts such as 'protection by constructional safety' (Ex c) or 'protection by inherent safety' (Ex g). These concepts give basic rules for minimising risks from such areas as excessive temperatures in brakes, electrostatic build-up in plastics and frictional ignitions from gearbox or other rotating components. Many of the requirements involve the use of correct selection and use of components coupled with reliability and maintenance data.

Engine emissions.

In addition to these obvious safety requirements are the requirements for exhaust and other emissions covered by Directive 97/68/EC. This directive covers all off-road diesel engines and specifies emission limits for NO_x, CO, CO₂ and particulates. However, for engines specifically for use in explosive gas atmospheres, other considerations need to be taken into account, for example the possibility of the ingestion of explosive gas into the intake. The problem here is that, whilst there are a number of draft European Standards there are none currently published. However, the wording of the Directives allows the use of the current technology available and this can be National standards, if it can be proved that they satisfy the requirements across Europe. Currently the benchmark for emissions is BS 6680:1989. Practically, emissions problems are compounded by the fitting of non-standard protection components such as flametraps, exhaust coolers and spark arresters all of which create havoc with the original engine emission specification as well as invariably reducing the overall power of the unit. Informed design is essential when engine modifications are being considered.



Approvals

Diesel machines can fall between two designations and it is often difficult for the manufacturer to determine which parts require third party approval and which can be assessed internally.

The electrical equipment and engine itself are required to be certified by a European Notified Body. These bodies are independent test houses appointed by each country and work to harmonised practices and systems. This has the beneficial effect that equipment tested and certified in one EU country can be directly acceptable in any of the others.

Mechanical aspects can be addressed by the manufacturer using a comprehensive risk assessment and technical file. The file should contain the original design specification and document each step through to the production of the machine itself. After 1 July 2003 all mechanical equipment for use in hazardous areas will have to be addressed against the requirements of 94/9/EC (ATEX Directive).

This requirement will directly affect the equipment your engine will be used with. Sira can offer compliance advice for the production of a technical file.

Examples of Standards Relating to Diesel Engines

Standard Reference
EN 1834-1 to 4:2000 (covers the use of diesel engines for use in gas and dust areas)
BS 6680:1985 (emissions specific to coal mining applications)
EN 12874: 2000 (testing of flame arresters)
EN 50014:1997 (range of standards covering the use of electrical equipment)
PrEN 13463:2000 (range of standards covering the use of mechanical equipment)
EN 1755:2000 (specific to forklift trucks)

Quality

Quality systems have become more and more an integral part of hazardous area equipment manufacturing. In the past, Notified Bodies have applied various criteria to ensure the continued compliance of equipment to the certified design. ISO 9000 has been seen as the minimum benchmark but this is a general quality standard and does not take into account the particular nature of this type of equipment. However, the ATEX Directive has focussed attention more acutely on the critical aspects of designs and the draft European Standard EN 13980 has been developed to expand on the basic ISO 9000 system with particular attention to hazardous area products.



Sira undertakes quality systems auditing as part of their approvals process and it is generally recognised as being a valuable aid to maintaining user confidence. As more companies are appreciating the benefits in the developments in approvals requirements, they are beginning to specify compliance with the current and forthcoming standards as part of the quotation package. It is likely that countries outside the EU will adopt the same methodology to prove the safety of diesel machines in future and CE marking is already regarded as best practice by many international coal and petrochemical companies.

Notified Body

Sira is an independent 'Notified Body' in Europe with accreditation from UKAS for its test and Certification activities. Recognised across the world, Sira is heavily committed to diesel engines. Sira provides an approachable and flexible route to certification where the global marketplace remains extremely competitive.

Sira's growing reputation

Sira has undertaken hazardous area certification work for a number of UK, European and International Diesel Engine manufacturers. We already have an enviable reputation for a quality no-nonsense service that is flexible enough to achieve your demanding goals whilst remaining flexible and responsive. The service offered by Sira compares favourably with that offered by other certification and approvals bodies.

Recognition of Sira Certificates

In an ever competitive global market, Sira has recognised the competitive advantage required by equipment manufacturers and has set up a number of international agreements with NRTL's (Nationally Recognised Testing Laboratories).

Sira currently has the following recognition agreements

FM	-	North America
UL	-	North America
CSA	-	Canada
MSHA	-	North America
SABS	-	South Africa
Test Safe	-	Australia

In addition, Sira is currently in negotiation with the Japanese Ministry of Labour to be a 'Designated Foreign Testing Laboratory'. This will allow acceptance of our certificates by **TIIS** of Japan. Sira's agreement with **CSA** will assist in obtaining access to the Canadian market. Sira will actively seek to set up further recognition agreements with other national certification bodies at our customer's request, thereby enabling a single source for all your motor approval requirements.

On-site assessments and testing

Our engineers can arrange to visit your premises to effect physical and drawing assessments and witness/conduct any necessary testing such as heat run tests. Sira is also able to offer the facility of performing all your company's pressurised and flameproof certification testing at your site, thereby significantly reducing testing completion times.

On-site testing has the advantage of having Sira staff, with extensive hazardous area experience, at our premises to assist you in achieving the best scope for the certification of your equipment.

Furthermore, when the testing and assessment is completed on-site, a major part of the certification process is completed, thereby greatly reducing your time to market.

You may also wish to take advantage of Sira's favourable testing timescales and use our test reports to reduce your certification time scale whilst working with other notified bodies.

Sira Service Features

Sira offers a range of innovative features when carrying out your company's test and assessment work:

- **Fixed price quotations**
- **Budgetary estimates**
- **Free initial two hour meeting**
- **Pre-certification support**
- **Regular updates of project progress**
- **Flexible payment terms**
- **Dedicated account management**

Sira will be pleased to provide your company with a quotation for multiple applications at a more favourable price.

More Information?

To discuss how Sira can provide a cost efficient and technically correct route to diesel engine certification, please contact **Steve Otty** or **Andy Allen** at the Hazardous Area Centre in Chester.

Sira Test & Certification