E-PIMS

European – Pipeline Integrity Management System

Overview to Consultation Document

Background: The New EU Pipeline Safety Regulations

European pipeline owners and operators may need to meet the requirements of a potential European Pipeline Safety Instrument (PSI) 'REGULATORY BENCHMARK FOR THE CONTROL OF MAJOR-ACCIDENT HAZARDS INVOLVING PIPELINES'. Such a PSI will require operators in Member States of the EU to have a document setting out a Major-Accident Prevention Policy and to establish a Pipeline Management System, including emergency response procedures.

Proposed Project

The attached Consultation Document describes a project (E-PIMS) that will help operators satisfy the new PSI. Recipients of this consultation document are asked for feedback. Following the final review of the successful EC funded ISPDM[1] (Industry Standard Pipeline Data Management) project the Commission suggested consideration be given to a follow on project in the related area of risk management and pipelines.

The format of the document follows the guidelines of an EC, Framework Six (FP6) submission. The content is designed to establish the main research areas and how they satisfy FP6 objectives. Certain research topics were incorporated following informal discussions with the EC, including the Joint Research Centre's Major Accidents Hazards Bureau (MAHB). It is anticipated that the MAHB will also participate in this project as it has conducted research into pipeline safety.

EU Submission

The proposal will be submitted under *Improving Risk Management* of the Information Society Technologies (IST) 2003-2004 Workprogramme. This requires research to take into account environmental and crisis management, the INSPIRE[2] initiative, the GMES[3] action plan and other FP6 thematic priorities, notably priorities 4 (Aeronautics and space) and 6 (Sustainable development, global change and ecosystems). The IST research requirements are closely aligned with a number of obligations incorporated in the PSI. Therefore, the E-PIMS project will deliver solutions, acceptable to the Commission, to meet these obligations.

[1] See www.ispdm.org.
[2] The INfrastructure for Spatial InfoRmation in Europe. http://inspire.jrc.it
[3] Global Monitoring for Environment and Security.

Project Team

The project consortium currently includes a number of organisations from industry and academia. The consortium developed the initial research concepts with input from the Commission and a number of industry sources. Considerable work remains to fine tune the research focus and develop detailed work plans. The details in the call for proposals, mid June 2003, and the proposed funding instruments will also influence the final scale and content of the research. Support and participation from pipeline owners and operators in this process is sought.

Support for, or participation in, this project has two major benefits:

- As the project progresses research can be re-directed and re-focused to ensure all deliverables, immediately available to all participants, are fully compliant with the obligations of the PSI.
- Opportunities will arise to input to the development of the PSI, thereby ensuring that the final regulatory document is based on consensus between the Commission, regulatory authorities and industry.

Funding

The EU will be asked to provide funding for this project, with the usual matching funding from consortium members. Additionally, sponsorship funding is also sought in two main areas:

- A nominal amount to assist with the detailed preparation and submission of the proposal.
- Assistance with funding the matching costs of not-for-profit academic institutions.

ISPDM

E-PIMS

European Pipeline Integrity Management Systems

Proposal for an EC Funded Research Project

Consultation Document

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Glossary

ALF	Airborne Laser Fluorosensor.
ALH	Airborne Laser Hydrography.
CASCADE	**C**o-operation **a**nd **S**tandards for Life **C**ycle **A**ssessment **D**ata in **E**urope.
DGENV	Directorate General for Environment.
DGRESEARCH	Directorate General for Research.
DNV	Det Norske Veritas.
E-PIMS	European Pipeline Integrity Management Systems.
EPRP	Emergency Planning and Response Procedures.
ERA	European Research Area.
ERRA	Emergency Risk and Response Assessment.
GIS	Geographic Information System.
GMES	Global Monitoring for Environment and Security.
HSE	Health and Safety Executive (UK).
INSPIRE	INfrastructure for SPatial Information in Europe.
ISPDM	Industry Standard Pipeline Data Management (www.ispdm.org).
ISO	International Standards Organisation.
ISO 15926	The ISO standard for the Integration of life-cycle data for process plants including oil and gas production facilities.
IS	Information Systems.
IST	Information Society Technologies.
JRC	Joint Research Center, European Commission.
LADS	Laser Depth Sounding.
LEAF	Laser Environmental Airborne Fluorosensor.
LIDAR	Light Detection And Ranging.
LPG	Liquefied Petroleum Gas.
MAHB	Major Accident Hazards Bureau (part of the JRC).
MAPP	Major-Accident Prevention Policy.
MARS	Major Accident Reporting Scheme.
OWL	Ontology Web Language.
PIMS	Pipeline Integrity Management System.
PMS	Pipeline Management System.
PRESENSE	**P**ipeline **Re**mote **Sen**sing for **S**afety and the **E**nvironment.
PSI	Pipeline Safety Instrument.
RBI	Risk Based Inspection.
RBM	Risk Based Maintenance.
SMART	Specific, Measured, Achievable, Realistic and Timely.
STEP	STandard for the Exchange of Product Data, ISO 10303.
Seveso	In 1976 a major accident at the ICMESA Chemical plant on the outskirts of Seveso, 20Kms. north of Milan, caused the release into the atmosphere of highly dangerous dioxins. As a result the European Commission developed regulatory requirement for the prevention of major accidents. These are known as the Seveso Directive and Seveso II Directive.
TPRC	Task Performance Resource Constraint.
VOGUE	Visualisation Of Gas for Utilities and the Environment.
W3C	World Wide Web Consortium.

Executive Summary

- **This document outlines the research focus of the proposed E-PIMS project. The layout of the document is in accordance with an EC STREP (Strategically Targeted Research Proposal) submission.**

- **The Commission's consultative Pipeline Safety Instrument, PSI, has been used to define the core content of the proposed project. The PSI is the extension of the Seveso II directive into the pipeline domain.**

- **The project will also build on the success of the, FP5, IST funded ISPDM project that met all its objectives and deliverables on time and on budget.**

- **There are both technical and non-technical aspects to the research focus.**

- **Technical aspects are:**
  - **Advanced Risk Assessment Methodologies.**
  - **Performance Measures.**
  - **Integrity Goals.**
  - **Inspection Techniques.**
  - **Emergency Planning and Response – Crisis Management.**
  - **IS Infrastructure and Technologies.**

- **Non-Technical aspects are:**
  - **Organisational Issues.**
  - **Human Factors.**

- **The E-PIMS project focuses on thematic priority 2, IST. However, there are strong synergies with:**
  - **Thematic priority 4 - Aeronautics and space.**
  - **Thematic priority 6 - Sustainable development, global change and ecosystems.**

- **The project deliverables will include:**
  - **Guidelines, structured methodologies and software tools necessary to implement E-PIMS.**
  - **Guidelines and methodologies on implementing emergency planning and response procedures (EPRP) and the necessary IS infrastructure including linkages to regulatory authorities, emergency services and the public.**
  - **Assessment of the technologies required to integrate data from space and airborne sensors including the PRESENSE systems.**
  - **The development of a PIMS INSPIRE node or INSPIRE compliant XML exchange document.**
  - **Extension of the ISPDM ISO compliant data store and XML exchange document.**

- **The beneficiaries will be the many stakeholders in pipeline safety including:**
  - **The public.**
  - **The pipeline owner(s).**
  - **The pipeline operator.**
  - **The owner of the product being transported.**
  - **The regulatory authorities.**
  - **Pipeline inspection companies.**
  - **Pipeline maintenance companies.**

- **The project will contribute to a constructive and consensus relationship between governments (regulators), business (pipeline owners and operators) and the public through the development of linked infrastructure, technologies and information systems to support open and transparent data access and exchange.**

- **Pipelines are pan-European in nature. Therefore, pipeline safety and integrity management should be addressed at the European, and not national, level particularly as previous work by DGENV has identified significant gaps in current national legislation in this area.**

- **The current consortium includes institutions from accession countries and thus contributes to the widening of the European Research Area. An expanded project would require further contribution from such countries.**

- **The project has the potential to make use of, and contribute to, the ISO 15926 and ISO 14000 standards.**

- **The primary drivers for E-PIMS are the safeguarding of human life and the protection of the environment, both of which are core European Union values.**

- **In addition it will contribute to the security of Europe's energy supplies.**

- **Expressions of interest to contribute to, or participate in, this project are sought.**

1.0 Introduction

Article 6, section 2(B) of the Sixth Community Environment Action Program[4] states as an objective:

> *"-developing further measures to help prevent the major accident hazards with special regard to those arising from pipelines, mining,……"*

Article 6 also references the importance of soil protection and protection and conservation of the marine environment. Pipelines pose considerable threats to both the land and marine environment as well as to the safety of human life.

An essential measure to help prevent major accidents is a European Pipeline Integrity Management System (E-PIMS). In 1998 the Commission published a consultative document *"REGULATORY BENCHMARK FOR THE CONTROL OF MAJOR-ACCIDENT HAZARDS INVOLVING PIPELINES (PIPELINES SAFETY INSTRUMENT)"*. This discussion document, the PSI, is used as the framework in which the proposed E-PIMS project is set.

Article 7 of the PSI calls on pipeline operators to establish a Major-Accident Prevention Policy (MAPP) and a Pipelines Management System (PMS). A MAPP is out with the scope of an E-PIMS project as a MAPP is a high level policy that should cover all aspects of an organisation's activities, not just pipelines. A PMS has two fundamental components: Pipeline Integrity Management System (PIMS) and Emergency Planning and Response Procedures (EPRP).

The PSI also requires close co-operation and exchange of information between Regulatory Authorities (governments) and pipeline operators. In addition certain information is required to be made available to the public.

The foregoing requirements require considerable research and the development of new techniques and systems in order to provide the foundation of a state of the art PMS. Therefore, this project addresses the following IST objectives.

The primary objective addressed is 2.3.2.9 Improving Risk Management that states as an objective *the development of open platforms, integrated systems and components for improved risk management civil security applications (…) and environmental management.* It also states that there should be *a contribution to the GMES action plan, notably to the development of the part related to risk management.*

One focus of the research is to *help the development of a European info-structure and associated services for environmental and crisis management. In particular actions to improve co-ordination towards harmonisation and standardisation of ontologies and sophisticated metadata architectures taking into account the requirements developed under the INSPIRE initiative.* Furthermore there is a requirement to ensure co-ordination *with other relevant FP6 thematic priorities, notably thematic priorities 4 and 6.*

[4] Decision No 1600/2002/EC of the European Parliament and of The Council, 22 July 2002

In connection with standardisation of ontologies is should be noted the ISO 15926 is based on an ontology that is very close and complimentary to the ontology language "OWL" developed by the W3C consortium, This will provide access to a variety of standard software.

There are exceptionally strong links between pipeline integrity and risk management and the environment. Pipelines carry a variety of corrosive gases, chemicals and oils that all have potential to do significant environmental damage.

A consortium member, POSC Caesar, in involved with the EC funded CASCADE[5] project that deals with making Life Cycle Assessment (LCA) data available according to ISO 15926. This is data required for Environmental Management Systems in accordance with ISO14040 – 14048[6].

To a lesser extent the project addresses objective 2.3.1.9, Networked businesses and governments, in terms of building *faster and more effective partnerships* and sharing *efficiently knowledge and experiences*. Trust and information exchange between the regulators (governments) and operators (business) is essential to PMS and PIMS.

In addressing objectives 2.3.2.9 and 2.3.1.9 it is necessary to address some of the issues in objective 2.3.1.5, Towards a global dependability and security framework, with particular reference to *dependable network and information systems* and *decision support tools*. In relation to this as ISO 15926 is based on an ontology data is defined in a neutral way independent of any particular application, operating system or data store. This provides a basis for dependable systems and longevity of the data.

[5] CASCADE Project: G7RT-CT-2001-05045.
[6] ISO 14040-14048 are the subsets of ISO 14000 (Environment Management Systems) that deal with Life Cycle Assessment and Data Documentation Format.

2.0 Main Research Areas

Many current PMS and PIMS systems in use are very limited in scope. A web search using the key words, *Pipeline+Integrity+Management+ System*, reported 79,700 hits. The first relevant hundred hits were split:

- Software products 40%.
- Consultancy services 40%.
- Inspection services 20%.

Such 3rd party commercial products and services do not, and cannot, encompass major and critical aspects of PMS and PIMS. They focus on a subset of issues which must be included in a sound, safe and reliable PIMS.

Given the foregoing E-PIMS will not focus on the current software packages and services that abound. It will focus on more fundamental issues that are essential to PMS and PIMS to ensures safe and reliable pipeline infrastructure across Europe. This leads to the safety of human life, protection of the environment and security of energy supply. The research will focus on both technical and non-technical issues:

- Technical issues are:
  - Advanced Risk Assessment Methodologies.
  - Performance Measures.
  - Integrity Goals.
  - Inspection Techniques.
  - Emergency Planning and Response.
  - IS Infrastructure including decisions support tools, multi-system interfaces, information and data management and information and data exchange.

- Non-technical issues are:
  - Organisational Issues.
  - Human Factors.

There are many linkages between the technical and non-technical aspects of PIMS. Therefore, it is important to note that, IS systems and infrastructure are essential to support aspects of the non-technical issues and provide a platform for integration with technical issues.

In addressing the foregoing the project has the following scientific and technological objectives:

- **Advanced Risk Assessment Methodologies.**
  To conduct research into advanced risk assessment methodologies. This will incorporate work done by the Commission's Major Accident Hazards Bureau (MAHB) in establishing the requirement for risk-based inspection and maintenance strategies in a variety of industrial sectors including nuclear, petrochemical, offshore, steelwork, etc. The different approaches conducted at a national level by member states will be considered. Research will use structured

risk and reliability techniques developed by the MAHB and academia and will include a set of deliverables to assist in the implementation of the appropriate techniques.

- **Performance Measures.**
  To identify and quantify performance measures that may be used to ensure the overall PIMS system is functioning correctly and that both the managerial and technical systems are interacting properly. Therefore the research will address both technical and non-technical aspects. Research in this area will build not only on an assessment of best practices but also on work previously commissioned by DGENV and DGRESEARCH. A structured research approach could use *high reliability organisational theory*; in particular the key processes identified by such theory

- **Integrity Goals.**
  To develop a list of integrity goals and how they can be achieved. These are very closely tied to performance measures and their identification and application rely on advanced risk assessment methodologies.

- **Inspection Techniques.**
  To quantify the limitations of current inspection techniques and how the error budget of this data should be incorporated into advanced risk assessment methodologies. This issue has been raised by the UK regulator and centers round the uncertainty models used in risk based inspection and maintenance decisions.

  To investigate the appropriateness of advanced systems for new pipelines and cost effective improvements in old networks that can be linked to alarm and emergency response systems. This will include studying a current DG Research Project, VOGUE.

  To investigate the potential to integrate satellite and airborne sensors in real time into PIMS, EPRP and environmental monitoring. Research will study, and report on, the appropriateness of various sensors and the IS issues involved in integration of such data. This will include studying a current DG Research Project, PRESENSE.

- **Emergency Planning and Response – Crisis Management.**
  To identify the critical component for environmental crisis management and establish guidelines and methodologies for establishing and implementing EPRP. Research will build on work being done in UK for the HSE (Health and Safety Executive) in the area of pipelines. Techniques and processes such as SMART Response (**S**pecific, **M**easured. **A**chievable, **R**ealistic and **T**imely), Scenario Envelope Analysis, ERRA (**E**mergency **R**isk and **R**esponse **A**ssessment) and the TPRC (**T**ask **P**erformance **R**esource **C**onstraint) model will be used. These techniques are both knowledge and risk based.

- **IS Infrastructure**
  To identify critical infrastructure, systems and components necessary to support PMS, PIMS and EPRP and to develop, as necessary, robust generic technologies and tools to support PMS, PIMS and EPRP, including linkages to regulators thus

enabling the development of dependable networks and information systems to protect society. One possibility is that ISO 15926 could form the basis of the hub of the required IS systems.

In addition to IS related activities, already discussed, the research will cover a number of other areas including:

- Decision support tools.
- IS technologies and infrastructure.
- One-call systems.
- Access to shared data.
- Database requirements.
- Data and information exchange.
- INSPIRE compatibility.

Decision support tools are essential to the audit of PMS and PIMS. They should record outcomes from the advanced risk assessment. Decisions made regarding inspection, maintenance and surveillance requirements to ensure safe operation must be recorded in such tools. When linked to performance measures the tools provide an overall management record. By developing the IS technologies for such tools the relevant information will be immediately available to regulators, emergency services and at-risk members of the public. In addition such systems will help to preserve corporate knowledge. The relevance of the other areas will be outlined in later sections of this proposal.

For such tools to function properly they will require access to structured data. In considering this, ISO 15926 provides an ideal integration environment. The implementation of an ISO 15926 solution is not research per-se, but a development of the IS technologies.

- **Organisational Issues**
  To assess and establish guidelines and methodologies for determining and establishing critical organisational factors in PMS, PIMS and EPRP. Research will include studying current best practice in the pipeline sector. However, it must be widened to other sectors. The work carried out by MAHB and DGENV in investigating organisational and managerial factors in major accidents in fixed installations will be studied, as there are many commonalties between the two different sectors. The research must be focused and use a structured approach to pull the work together and develop an approach for pipelines. One such approach that will be considered is *high reliability organisational theory*.

- **Human Factors**
  To assess and establish guidelines and methodologies for determining and establishing critical human factors in pipeline safety systems. Apart from the obvious issue of “human error” essential elements of human factors are training and required core competencies. These are crucial in enabling people, at all levels, to carry out their assigned roles and responsibilities effectively.

  People are continually interacting with the IS and other technical systems through out the entire PMS and PIMS process. This human / system interface has the

potential to be a major source of failure in the systems. It is necessary to improve organisational memory in order to minimise the risk of changes in managerial structures and personnel impacting on safety. This can only be achieved by diminishing human involvement and system dependency without risking performance. Improvement in decision support tools and technologies are critical to this area of human factors.

Research will build on JRC work into human factors in other sectors as well as other academic studies. Input is also anticipated from the UK HSE's Human Factor Team in the Hazardous Installations Directorate. Structured techniques from applied psychology and capability maturity modelling will be used to develop a pipeline context for human factors. As human factors impact on all aspects of PMS and PIMS the relevant areas of the work programme are those already identified.

- **Road Test**
  To assess and fine tune the project deliverables by undertaking a trial PMS, PIMS and EPRP implementation, in a controlled manner, on a selected pipeline, probably in an accession country.

As noted earlier 3rd party commercial products and services are extremely limited. While some individual organisations have well-developed PIMS many do not and many are also "paper based". Very few make the link to ERPR and environmental crisis management as outlined in the consultative PSI. The use of advanced risk assessment methodologies and associated performance measures and integrity goals are the exception rather than the rule and organisational and human factor issues have not really been addressed. IT systems and decision support tools are essential and it is clear from the foregoing, the web search and the evaluation of the IST funded ISPDM[7] project[8], based on ISO15926, that current systems and technologies fall far short of what is required.

This project is the first to make the explicit link between the control of major accident hazards involving pipelines and pipeline integrity management in accordance with the Seveso II directives. The project's objectives are extremely challenging but achievable. As a result this project will result in a major enhancement in the state-of-the–art in PMS, PIMS and EPRP.

[7] ISPDM: Industry Standard Pipeline Data Management – IST-1999-21112
[8] ISPDM IST-1999-21112, Project Assessment Report, Measurement and Evaluation of Results, D13.1/D14.1, 5 December 2002

3.0 Project Relationship to EC Policy

As noted earlier 2.3.2.9 Improving Risk management states as an objective *the development of open platforms, integrated systems and components for improved risk management, civil security applications (…) and environmental management.* It also states that there should be *a contribution to the GMES action plan, notably to the development of the part related to risk management.*

As stated earlier there are exceptionally strong links between pipeline integrity and risk management and the environment. Pipelines carry a variety of corrosive gases, chemicals and oils that all have potential to do significant environmental damage. The E-PIMS project aims to significantly improve risk management in relation to pipeline integrity. Pipeline integrity is crucial to the control of major accident hazards involving pipelines. The control and prevention of such accidents and the development of EPRP to cope with the eventuality of an accident are crucial elements in environmental management.

E-PIMS focus is on the "S" in GMES; the security and protection of citizens related to environmental threats. There is also a linkage to the "E" through POSC Caesar's involvement in the CASCADE project for Life Cycle Assessment (LCA). As a result it has a major input to some of the GMES objectives, section 3 of the GMES action plan. It is particularly relevant to goals outlined in the annex to the GMES action plan, in particular:

- B. Environmental Stress in Europe
- G. Systems for Risk Management

Both B and G contain references to oil spills. In particular G states the goal is *"To deliver operational systems to support risk management (early warning, impact assessment and reaction) in European sensitive areas for: floods; forest fires; oil spills; stability of man made structures"*.

Pipelines are one potential source of oil spills. Impact assessment is a fundamental out come of any risk assessment which is an integral component of PIMS. In any assessment of risk, the pipeline is split into sections with different levels of risk in terms of consequences of an accident. For example risk is higher in urban areas than rural areas. In a similar manner environmentally sensitive areas will be identify and risk assessed accordingly. Reaction is synonymous with EPRP. Therefore results from this project will form an important input to the deliver of operational systems supporting GMES risk management.

One focus improving risk management, noted earlier, is to *help the development of a European info-structure and associated services for environmental and crisis management. In particular actions to improve co-ordination towards harmonisation and standardisation of ontologies and sophisticated metadata architectures taking into account the requirements developed under the INSPIRE initiative.*

As discussed above in relation to GMES this project will help the development of such info-structure and services. However, there are a number of issues in relation to

INSPIRE that the project will address. These are connected with one-call systems and INSPIRE compatibility.

One-call systems are required to safeguard pipelines against third party interference. These do not exist in many member states and candidate countries. This area of environmental and crisis management is closely linked to the INSPIRE initiative. However, the data structures outlined in the INSPIRE initiative are in conflict with the engineering data structures required for advanced risk assessment, safety and integrity management of pipelines. This issue was highlighted by the ISPDM project but could not be resolved before completion of the project. However, the use of ISO 15926 will enable such different structures to coexist.

INSPIRE based systems and nodes rely on a spatial data model and an application need. However, national and international initiatives around the world identified that such data models were incompatible with the requirements to store complex engineering data. Later new generic models, in particular ISO 15926 which is based on ontology, were developed as the basis of engineering data warehouses. This model is being extended to also handle spatial data, and can therefore support integration of data across applications. Such an approach, adopted by ISPDM, is essential to store and mange all the pipeline engineering and other data required to support PMS and PIMS.

As many emergency response and crisis management systems use GIS technology it will be essential to develop seamless links between any PIMS and INSPIRE compliant GIS systems, including those that will be used as the basis of one-call systems. In addition, given the potential damage to life and the environment pipeline infrastructure must be included in INSPIRE based systems containing geographic data. As a result a standard INSPIRE node for PIMS may need to be developed.

Terrorism is an issue that relates to INSPIRE and one-call systems. Public access one-call systems offer terrorists the means to locate critical pipeline infrastructure. A balance between public access and security of information must be researched.

2.3.2.9 also has a requirement to ensure co-ordination *with other relevant FP6 thematic priorities, notably thematic priorities 4 and 6*. There are a number of issues that link E-PIMS to thematic priority 6. These are:

- 6.1.3.1.3 Alternative motor fuels. (Sustainable energy systems)
- 1.1.6.3 Global Change and ecosystems
  - V.1.2 Integrated Coastal Zone Management.
  - VII.I Development of advanced methodologies for risk assessment.

As the use of alternative motor fuels, including current LPG, becomes widespread, in line with the Commission’s targets, there will be a requirement to develop distribution networks that are likely to include pipelines. Given the volatility of such fuels safe distribution networks are essential. Having PMS and PIMS in place will greatly assist in the planning, design, development and operation of the networks.

Safe pipelines are integral to Coastal Zone Management. Land and marine ecosystems are particularly vulnerable to pollution from pipelines that can cause significant

damage to these ecosystems. E-PIMS adopts the precautionary principle and has a major contribution to make to environment risk assessment. Advanced risk assessment methodologies associated with PIMS do focus on the consequences for, and required actions to protect life and the environment.

With respect to thematic priority 4 The DG Research project, PRESENSE, is important to PMS and PIMS. PRESENCE is related to thematic priority 4 and involves developing techniques to monitor 3rd party interference in real time using various satellite systems. Such interference is one crucial element of pipeline integrity and the mechanisms and technologies required to use PRESENCE data in PIMS must be studied.

PRESENSE is focused on onshore gas lines and it is anticipated that any techniques developed during the project will be sufficiently generic in order to be applied to all onshore pipelines regardless of product. The question of monitoring 3rd party activity in relation to offshore pipelines, particularly in the inter-tidal and shallow water coastal zones is important in protecting the delicate marine ecosystems.

For a number of years airborne laser depth sounding has been successfully used in a number of parts of the world. It uses LIDAR (**LI**ght **D**etection **A**nd **R**anging) technology. The systems are known by a number of acronyms including LADS (**LA**ser **D**epth **S**ounding) and ALH (**A**irborne **L**aser **H**ydrography). This technology may be capable of being adapted and integrated with PIMS to monitor 3rd party interference in the coastal zone, rivers, and shallow water inland lakes.

The oil and gas exploration industry helped develop ALF, (**A**irborne **L**aser **F**luorosensor). This is used to detect minor traces of hydrocarbon in the water column. It has been used for environmental monitoring and Canada developed LEAF (**L**aser **E**nvironmental **A**irborne **F**luorosensor). Such a technique could provide an early indication of pipeline leakage. As with laser depth sounding, ALF technology could possibly be integrated into PIMS, emergency response and associated environmental crisis management.

In addition to the airborne systems, ocean monitoring satellites have been around for many years. These have included the early American Seasat satellite (1978), the European ERS-2 satellite (1995) and its replacement the Envisat 1 satellite (2002). The American OrbView-2 satellites can measure and track marine photoplankton. Therefore such satellites together with the latest Landsat-7 and SPOT-5 satellites may offer ways to identify, at an early stage, environmental pollution from damaged pipelines in remote areas both offshore and onshore.

The challenge with all these techniques would be to develop the IS technologies and infrastructure necessary to integrate such data, in real time, into PMS, PIMS and EPRP. If this was achieved it would be a considerable advance in environmental crisis management in relation to major accidents involving pipelines. As noted earlier research will be limited to studying, and reporting on, the appropriateness of various sensors and the IS issues involved in integration of such data

Objective 2.3.1.5, Towards a global dependability and security framework, of the IST work plan has as an objective *"To strengthen security and enhance dependability of*

the information and communication systems and infrastructures and to ensure trust and confidence in the use of IST by addressing new security and dependability challenges..…… Integrated and comprehensive approaches involving all relevant stakeholders of the value chain should address security and dependability at different levels and from different perspectives".

2.3.1.9, Networked businesses and governments, objective is *"To develop ICTs supporting organisational networking, process integration, and sharing of resources. This shall enable networked organisations, private and public, to build faster and more effective partnerships and alliances, to re- engineer and integrate their processes, to develop value added products and services, and to share efficiently knowledge and experiences"*. One focus is *"Managing knowledge to support innovation and business strategies through sharing, brokering, trading and measuring of knowledge and intellectual capital"*.

The PSI places a not inconsiderable requirement on the sharing of data and information between regulators (government) and pipeline operators (business) and public access to certain data. This requires the development of secure and dependable networks and the sharing of knowledge and experiences. Therefore integral to PMS and PIMS is the need for all parties, regulators, operators, crisis planners and the public to access a wide variety of data. This goes beyond traditional database and data exchange. The emphasis must be on access to shared data, which was one of the tenets behind ISPDM. ISPDM complies with ISO 15926, which is designed to integrate, consolidate and manage what is known about something.

Data is also required to support decision support tools, advanced risk assessment methodologies and one-call systems. During research into these issues, data requirements will be identified and extensions to the ISPDM data model, which is a subset of ISO 15926, and data exchange functionality, will be developed.

Therefore the E-PIMS project contributes to the IST objectives 2.3.1.5 and 2.3.1.9. More generally the project addresses aspects of the main societal and economic challenges outlined in section 2.2.2 of the IST work programme. In particular the project supports solving *"trust and confidence"* problems and supports complex problem solving in science, society, industry and businesses.

In a broader context E-PIMS addresses a major societal and economic challenge; the safe transport of products by pipelines thus safe guarding life and the environment. The project addresses the core values of the Community's sixth environmental action plan, decision No. 1600/2002/EC, and sixth framework research programme, decision No. 1513/2002/EC. The safety to human life and protection of the environment are core European Union values.

4.0 Project Impact vis-à-vis EC Policy and Objectives

In order to discuss the strategic impact it is necessary to briefly review the PSI. There are many stakeholders in pipeline safety. These include:

- The public.
- The pipeline owner(s).
- The pipeline operator.
- The owner of the product being transported.
- The regulatory authorities.
- Pipeline inspection companies.
- Pipeline maintenance companies.

There are many important interactions between the stakeholders. Requirements to formalise many of these interactions are outlined in the Commission's 1998 consultative PSI. This is used as a framework to define the major research topics. A number of specific articles have been identified that need to be supported with more research leading to the production of guidelines, benchmarks, tools, IS infrastructure, etc., that can be used across Europe by all stakeholders. These are:

Article 6.2 (g)

The need to know where a pipeline is and the likely causes of a major accident and/ or its consequences. This requires research into risk assessment techniques.

Article 7 in its entirety.

Outlines the requirement for a MAPP and PMS, including associated performance measures, and the requirements for member states to be assured that these requirements are being met. This requires research into the interaction between regulators and pipeline owner(s) / operators and the development of quantifiable performance measures.

Article 9 in its entirety.

This deals with emergency planning and, again, a requirement for member states to ensure the plans are effective. Research has to focus on the links between PIMS and emergency planning using formal structured research techniques.

Article 10 (b)

This requires formal reporting on accidents and emergency response actions. Again it requires member states to quality assure these procedures and actions.

Article 12 in its entirety.

This requires the establishment of a "One-Call" system. Within E-PIMS the requirement of such a system can be addressed in terms of harmonisation across Europe. This article also has implications for security vis-à-vis terrorism, which is an area of valid research.

Article 14 in its entirety.

This article impacts on the planning authorities in member states. This defines an important link between PMS, risk assessment and environmental impact studies.

Article 15 in its entirety.

This requires the regulators to ensure information on safety measures is forthcoming to the public and other stakeholders. Again this involves research into risk assessment and emergency response.

Article 17 in its entirety.

This article covers pipeline inspection. In many member states no formal guidelines on minimum requirements and hence no safety guidelines exist to ensure that adequate inspection is being conducted. Addressing this involves the development of risk based inspection maintenance processes.

Articles 19 & 20 in their entirety

These cover a need (expressed by both industry and Competent Authorities on which Commission fully agrees and supports) for a common Pipeline Accident Reporting System similar to MARS for Seveso accidents. Therefore research is required into information systems and exchanges complemented by accident reporting criteria and common shared reporting system. This is required since pipelines exhibit dissimilarities compared with fixed installations as far as Operators, Accidents and jurisdiction of pipeline Competent Authorities are concerned.

Annex II

This outlines in more detail the requirement for a MAPP and PMS. It brings together many of the foregoing points plus organisational and personnel issues. This requires research into "human factors", management and organisations.

Annex IV

This outlines in more detail emergency planning requirements. Such planning is extremely difficult without first conducting a risk assessment and safety audit.

There are a number of implications that come out of the PSI.

- A requirement is placed on pipeline operators to establish PMS and by implication PIMS and EPRP.
- Considerable onus is placed on member states regulatory authorities to monitor, review, assess, audit and approve the pipeline operator's PMS and PIMS.
- Reporting and public access to information is required.

It is important to note that, by implication, the emergency planning and response requirements of the PSI are designed to mitigate against, and limit, the effects of a pipeline failure on life and the environment. This holds to the precautionary principle.

E-PIMS will create an environment in which PMS can be developed and implemented in a controlled and structured manner taking into account **all** aspects and factors that have to be addressed. Previous Commission research identified considerable gaps and differences in pipeline safety regulations across member states. Therefore, it is essential to provide a framework that all owners, operators and regulators can use to establish and assess the PMS at a European level. E-PIMS will provide this Pan-European framework.

In order to develop this framework there are a number of innovation-related activities:

- The comprehensive nature of the research through integrating all major aspects of pipeline integrity is one cohesive study has not been undertaken before. In particular, the introduction of organisational and human factors into the research.

- The linking of output from advanced risk assessment to crisis management inputs.

- The development of advanced data access, information sharing and exchange technologies and infrastructure.

- Assessment of the value and feasibility of integrating airborne and space sensor data, in real time, into PIMS and ERPR and the technologies required to achieve this.

This project will contribute to a constructive and consensus relationship between government (regulators), business (pipeline operators) and the public through the development of linked infrastructure, technologies and information systems to support open and transparent data access and exchange. This leans towards an integrated approach to generic and applied technology development as well as addressing some of the socio-economic dimensions of pipeline safety that rely on IST.

In addition Europe's energy supply will become increasingly dependent on regions out with Europe, notably Russia, The Middle East and North Africa. To ensure reliability of supply a well-managed pipeline infrastructure is essential. Therefore a secondary driver benefit is security of energy supplies:

In the USA the development of PIMS involves industry bodies such as API and ASME. Input also comes from other organisations such as the Gas Research Institute (GRI) and the Pipeline Research Council International (PRCI). The USA industry can finance these initiatives via government funding (Office of Pipeline Safety/NTSB). The research institutes and associations are partly financed by pipeline operators, but also receive substantial funding from the US government.

This type of funding is not available in the European Union and, as a result, pipeline safety is generally addressed at national level. There is some work being done through CEN to develop pipeline integrity guidelines. However, this covers a limited sub-set of a PMS and is applicable only to onshore gas transmission pipelines. Comprehensive guidelines covering all types of pipelines are required. Given the probability of a European Pipeline Safety Instrument a project such as E-PIMS will only succeed if funded at the European level with support from the European Commission.

Europe should be proactive in pipeline safety and regulation. Regulation and standardisation are better achieved at the European, rather than national level, and E-PIMS is a fundamental component of such an approach.

5.0 Project Relevance to Standards

The E-PIMS project will contribute to standards in a number of ways:

- In the short term it could provide regulators with a framework to upgrade, where applicable, their own national standards with a view to eventual harmonisation across Europe.

- Alternatively, in the short term, it could compliment existing standards and guidelines being developed at the European level such as the CEN initiative discussed earlier.

- In the medium to long term it could be developed, with consensus, to form an EN standard for PMS.

- The EC funded ISPDM project delivered into the public domain an ISO compliant Industry Standard Pipeline Data Management database system for the storage and management of the wide variety of data required to support PIMS. The data model (ISO 15926-part2), data definitions (ISO 15926-part 4) and the data exchange XML document will be extended and enhanced to encompass new information generated during this project.

- This proposal has discussed the relevance and potential of ISO 15926 in connection with IS infrastructure and data sharing. This project has the potential to broaden the sectorial take up of the standard. Conversely use of the standard offers a logical and structured approach to harmonisation.

- Through the link with the CASCADE project E-PIMS will contribute to the extension of ISO 14000 into the pipeline domain in relation to environmental management.

6.0 Project Consortium

The E-PIMS project is a logical progressive development of ISPDM, and some of the ISPDM consortium members will play a prominent role in an E-PIMS project. A selection of candidates for the E-PIMS project consortium is:

- Det Norske Veritas (Norway) project co-ordinator, brings experience not only in pipeline integrity but also experience in the development of standards and certification of systems and processes.

- Penspen Integrity (UK), an ISPDM member, brings experience in pipeline integrity management, both onshore and offshore, and considerable knowledge of the North American initiatives and regulations.

- POSC Caesar, an ISPDM member, is the custodian of ISO 15926 and brings experience is standards development.

- Cranfield University (UK) brings considerable experience in advanced risk assessment, risk and reliability research, industrial psychology (organisational and human factor) and crisis management. They also bring an objective, non-commercial, view of the subject.

- University of Crete (Greece) brings a wealth of experience in pipeline safety and failure studies. Members of staff have already conducted considerable research for the Commission and have contributed to the development of the consultative PSI.

- The Oil & Gas Institute, Krakow (Poland) assist in extending the ERA and bring an accession country perspective to the project.

- ETL (UK), an ISPDM member and SME, brings considerable experience in the development and implementation of standards based data stores and XML exchange documents.

Additional technical expertise is required in two areas:

- INSPIRE compliant development, preferably a SME GIS specialist.

- Remote sensing technologies to support the aerospace element of the project.

In addition active participation is sought from industry either at an individual company level or industry grouping / association level.

7.0 Outcomes and Deliverables

At this stage it is not possible or advisable to endeavour to pre-empt the outcomes of the proposed research. However, it will make a major contribution of improving pipeline safety in member states and accession countries as well as influencing policy and practices in other areas such as the FSU, Balkans, North Africa and the Middle East.

A number of substantial deliverables are anticipated from the base E-PIMS project. These deliverables will be aimed both at pipeline operators and the regulatory authorities in member states and candidate countries. Deliverables will include:

- High level guidelines on implementing PMS, PIMS and EPRP, including the relationship with MAPP.
- Guidelines, including workbooks or practice, covering advanced risk assessment methodologies, risk acceptance criteria, risk based inspection and maintenance strategies and risk based decision making.
- Methodologies for assessing and implementing organisational, managerial and technical aspects of PIMS.
- Identification and quantification of performance measures that may be used to ensure the overall PIMS system is functioning correctly and that both the managerial and technical systems are interacting properly.
- An assessment, guidance and methodology for determining and addressing critical human factors in pipeline safety systems.
- Guidelines and methodologies for establishing emergency response procedures based on identified risks.
- Identification and development of IS technologies, tools and infrastructure necessary to support a fully integrated pipeline safety system including required linkages to regulatory authorities, emergency services and the public.
- Identification and development of additional IS infrastructure, data exchange and additional advanced risk management techniques to support emergency planning and response (EPRP) and environmental crisis management.
- Assessment of the technologies required to integrate data from space and airborne sensors including the PRESENSE systems.
- The development of a PIMS INSPIRE node or INSPIRE compliant XML exchange document.

Appendix 1 Draft 1998 Consultative Pipeline Safety Instrument

REGULATORY BENCHMARK

FOR THE CONTROL OF MAJOR-ACCIDENT HAZARDS INVOLVING PIPELINES

(PIPELINES SAFETY INSTRUMENT)

Introduction

Member States are requested to consider all Articles and Annexes of the REGULATORY BENCHMARK and to clearly identify which provisions are already implemented in their national laws (please supply copies of relevant national laws, regulations and administrative provisions) as well as those which are not. In the latter case, Member States are invited to state whether they envisage developing the necessary measures to comply with the benchmark. Moreover, with respect to CHAPTER IV (Information system and exchanges, reporting), Member States are requested to indicate whether they will implement such arrangements on a voluntary basis.

Where existing national provisions contain a greater level of detail than the REGULATORY BENCHMARK, Member States should identify such details as 'performance measures' related to Article 7, paragraph 3 and one of the areas covered by Annex III.

Finally, the Member States and all interested parties are requested to identify any significant omissions from the REGULATORY BENCHMARK, particularly with respect to the proposed scope.

CHAPTER I: Aim, Scope, Definitions, Exclusions

Article 1

Aim

This Instrument is aimed at the prevention of major accidents which involve pipelines carrying dangerous substances and the limitation of their consequences for man and the environment with a view to ensuring high levels of protection throughout the Community in an effective manner.

Article 2

Scope

This Instrument shall apply to pipelines carrying dangerous substances listed in Annex I.

Article 3

Definitions

For the purposes of this Instrument:

1. 'pipeline' shall mean a pipe or a system of piping for the conveyance of fluids to or from an installation or premises, including the pipeline isolation device located within the confines of the installation or premises. This includes pumping stations and other equipment which are an integral part of the pipeline and all equipment relevant to the safe operation of the pipeline;
2. 'operator' shall mean any individual or corporate body who operates a pipeline or if provided for by national legislation, has been given decisive economic power in the technical operation thereof;
3. 'dangerous substances' shall mean a substance, mixture or preparation fulfilling the criteria laid down in Annex I, including those substances which it is reasonable to suppose may be generated in the event of accident;
4. 'major accident' shall mean an occurrence such as a major emission, fire, or explosion resulting from uncontrolled developments in the course of the operation of any pipeline covered by this Instrument, and leading to serious danger to human health and/or the environment, immediate or delayed, and involving one or more dangerous substances;

5. 'hazard' shall mean the intrinsic property of a dangerous substance or physical situation, with a potential for creating damage to human health and / or the environment;

6. 'risk' shall mean the likelihood of a specific effect occurring within a specified period or in specified circumstances;

7. 'safe operating limits' shall mean the operating limits for which the pipeline is suitable;

Article 4

Exclusions

This Instrument shall not apply to the following:

(a) distribution pipelines for natural gas. These are pipeline systems downstream of the transmission pipelines including piping above and below ground and all annexed installations necessary to supply customers;

(b) in-field gathering lines for oil and gas production;

(c) pipelines within an establishment as defined by Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances;

CHAPTER II: Obligations of the operator

Article 5

General obligations

1. Member States shall ensure that the operator is obliged to take all measures necessary to prevent major accidents and to limit their consequences for man and the environment.

2. Member States shall ensure that the operator is required to prove to the competent authority referred to in Article 11, hereinafter referred to as the 'competent authority`, at any time, in particular for the purposes of the inspections and controls referred to in Article 17, that he has taken all the measures necessary as specified in this Instrument.

Article 6

Notification

1. Member States shall require the operator to send the competent authority a notification:

— for new pipelines, a reasonable period of time prior to the start of construction or operation, and

— for existing pipelines.

2. The notification required by paragraph 1 shall contain the following details:

(a) the name or trade name and address of the operator;

(b) the registered place of business of the operator, with the full address;

(c) the name or position of the person in charge of the pipeline(s), if different from (a);

(d) information sufficient to identify the dangerous substances or category of substances involved;

(e) the size and safe operating limits of the pipeline and the physical form of the dangerous substance or substances carried;

(f) the function or intended use of the pipeline(s),

(g) the location and the immediate environment of the pipeline(s) including elements liable to cause a major accident or to aggravate the consequences thereof.

3. In the case of existing pipelines for which the operator has already provided all the information under paragraph 2 to the competent authority under the requirements of national law, notification under paragraph 1 is not required.

4. In the event of:

— any significant increase to the operating limits or significant change in the nature or physical form of the dangerous substance carried, as indicated in the notification provided by the operator pursuant to paragraph 2, or

— permanent closure of the pipeline(s),

the operator shall immediately inform the competent authority of the change in the situation.

Article 7

Major-accident prevention policy (MAPP) and Pipelines Management System (PMS)

1. Member States shall require the operator to draw up a document setting out a Major-Accident Prevention Policy (MAPP) and to establish a Pipeline Management System (PMS) to ensure that it is properly implemented. The Major-Accident Prevention Policy (MAPP) and the Pipeline Management System (PMS) shall be designed to guarantee a high level of protection for man and the environment.

2. Member States shall require the operator to demonstrate to the competent authority that a Major-Accident Prevention Policy (MAPP) and the Pipeline Management System (PMS) for implementing it have been put into effect in accordance with the structure set out in Annex II and covering the areas set out in Annex III.

3. Member States shall require that the operator establishes performance measures for monitoring the Pipeline Management System (PMS) in accordance with the principles contained in Annex II and covering the areas set out in Annex III.

4. The document setting out the Major-Accident Prevention Policy (MAPP) and a description of the

Pipeline Management System (PMS) including the associated performance measures must be made available to the competent authority.

Article 8

Modifications to a pipeline

In the event of the modification of a pipeline, or its operating limits or the nature of dangerous substances which could have significant repercussions on major-accident hazards, the Member States shall ensure that the operator:

— reviews and where necessary revises the Major-Accident Prevention Policy (MAPP) and the Pipelines Management System (PMS),

— informs the competent authority referred to in Article 11 of the details of such revision in advance of such modification.

Article 9

Emergency planning

1. Member States shall ensure that, for all pipelines covered by this Instrument:

(a) the operator draws up an emergency plan containing the information set out in Annex IV,

(b) the operator supplies to the authorities designated for that purpose the necessary information to enable the latter to draw up local emergency plans.

2. The emergency plans must be established with the objectives of:

— containing and controlling incidents so as to minimize the effects, and to limit damage to man, the environment and property,

— implementing the measures necessary to protect man and the environment from the effects of major accidents,

— communicating the necessary information to the public and to the services or authorities concerned in the area,

— providing for the restoration and clean-up of the environment following a major accident.

3. Member States shall ensure that emergency plans are reviewed, tested, and where necessary revised and updated by the operators at suitable intervals of no longer than three years. The review shall take into account changes of the pipelines concerned or within the emergency services concerned, new technical knowledge, and knowledge concerning the response to major accidents.

4. Member States shall ensure that emergency plans are put into effect without delay by the operator:

— when a major accident occurs, or

— when an uncontrolled event occurs which by its nature could reasonably be expected to lead to a major accident.

Article 10

Information to be supplied by the operator following a major accident

Member States shall ensure that, as soon as practicable following a major accident, the operator shall be required, using the most appropriate means:

(a) to inform the competent authorities;

(b) to provide them with the following information as soon as it becomes available:
— the circumstances of the accident,
— the dangerous substances involved,
— the data available for assessing the effects of the accident on man and the environment, and
— the emergency measures taken;

(c) to inform them of the steps envisaged:
— to alleviate the medium- and long-term effects of the accident,
— to prevent any recurrence of such an accident;

(d) to update the information provided if further investigation reveals additional facts which alter that information or the conclusions drawn.

CHAPTER III: Duties of the competent authority

Article 11

Competent authority

Without prejudice to the operator's responsibilities, Member States shall set up or appoint the competent authority or authorities responsible for carrying out the duties laid down in this Instrument and, if necessary, bodies to assist the competent authority or authorities at technical level.

Article 12

Prevention of external interference

Member States shall ensure that an information system for the prevention of external interference with the pipeline is implemented. This system should oblige:

— operators to supply details of the exact routing of their pipeline(s),

— all third parties, prior to undertaking excavation work in the vicinity of pipelines, to use the information system in order to inform themselves of the exact routing of the pipeline(s) in order to avoid any damage to the pipeline(s) which might result in a major accident, and

— land owners, users and occupiers of land where

pipelines are located to be supplied with details of the exact routing of pipeline(s) without them having to request it.

Such a system can either be set up by operators, or by other organisations, where the operators or organisation has the task of supplying information and/or assistance to third parties carrying out excavation work.

Article 13

Local emergency planning

1. Member States shall ensure that, for all pipelines covered by this Instrument, the authorities designated for that purpose by the Member State draw up local emergency plans for the measures to be taken in the surroundings of pipelines.

2. The emergency plans must be established with the objectives of:

— containing and controlling incidents so as to minimize the effects, and to limit damage to man, the environment and property,

— implementing the measures necessary to protect man and the environment from the effects of major accidents,

— communicating the necessary information to the public and to the services or authorities concerned in the area,

— providing for the restoration and clean-up of the environment following a major accident.

3. Without prejudice to the obligations of the competent authorities, Member States shall ensure that the local emergency plans are drawn up in consultation with the public liable to be affected by a major accident originating from a pipeline.

4. Member States shall ensure that local emergency plans are reviewed, and where necessary tested, revised and updated at suitable intervals of no longer than three years. The review shall take into account changes of the pipelines concerned or within the emergency services concerned, new technical knowledge, and knowledge concerning the response to major accidents.

5. Member States shall ensure that local emergency plans are put into effect without delay by the authorities designated for that purpose:

— when a major accident occurs, or

— when an uncontrolled event occurs which by its nature could reasonably be expected to lead to a major accident.

6. The competent authority may decide, giving reasons for its decision, in view of the information received from the operator, that the requirement to produce a local emergency plan shall not apply.

Article 14

Land-use planning

1. Member States shall ensure that the objectives of preventing major accidents and limiting the consequences of such accidents are taken into account in their land-use policies and/or other relevant policies. They shall pursue those objectives through controls on:

(a) the siting of new pipelines;

(b) modifications to existing pipelines covered by Article 8;

(c) new developments such as transport links, locations frequented by the public and residential areas in the vicinity of existing pipelines, where the siting or developments are such as to increase the risk or consequences of a major accident.

Member States shall ensure that their land-use and/or other relevant policies and the procedures for implementing those policies take account of the need, in the long term, to maintain appropriate distances between pipelines covered by this Instrument and residential areas, areas of public use and areas of particular natural sensitivity or interest, and, in the case of existing pipelines, of the need for additional technical measures in accordance with Article 5 so as not to increase the risks to people.

2. Member States shall ensure that all competent authorities and planning authorities responsible for decisions in this area set up appropriate consultation procedures to facilitate implementation of the policies established under paragraph 1. The procedures shall be designed to ensure that technical advice on the risks arising from the pipelines is available, either on a case-by-case or on a generic basis, when decisions are taken. Member States shall also ensure that the public is able to give its opinion.

Article 15

Information to persons liable to be affected by a major accident

1. Member States shall ensure that information on safety measures and on the requisite behaviour in the event of an accident is supplied, without their having to request it, to persons liable to be affected by a major accident originating from a pipeline covered by this Instrument.

The information shall be reviewed every three years and, where necessary, repeated and updated, at least if there is any modification within the meaning of Article 8. It shall also be made permanently available to the public. The maximum period between the repetition of the information to the public shall, in any case, be no longer than five years.

Such information shall contain, at least, the information listed in Annex V.

2. Member States shall, with respect to the possibility of a major accident with transboundary effects originating from a pipeline covered by this Instrument, provide sufficient information to the potentially affected Member States so that all relevant provisions contained in Articles

13, 14 and this Article can be applied, where applicable, by the affected Member State.

Article 16

Duties of the competent authority following a major accident

1. Member States shall require the competent authority:

(a) to ensure that any urgent, medium- and long-term measures which may prove necessary are taken,

(b) to collect, by inspection, investigation or other appropriate means, the information necessary for a full analysis of the technical, organisational and managerial aspects of the major accident,

(c) to take appropriate action to ensure that the operator takes any necessary remedial measures and

(d) to make recommendations on future preventive measures.

2. For the purpose of prevention and mitigation of major accidents, Member States shall inform the Commission as soon as practicable of major accidents meeting the criteria of Annex VI which have occurred within their territory. They shall provide it with the following details:

(a) the Member State, the name and address of the authority responsible for the report;

(b) the date, time and place of the major accident, including the full name of the operator and the location of the pipeline involved;

(c) a brief description of the circumstances of the accident, including the dangerous substances involved, and the immediate effects on man and the environment;

(d) a brief description of the emergency measures taken and of the immediate precautions necessary to prevent recurrence.

3. Member States shall, as soon as the information provided for in Article 10 is collected, inform the Commission of the result of their analysis and recommendations using a report form established and kept under review.

Reporting of this information by Member States may be delayed only to allow for the completion of legal proceedings where such reporting is liable to affect those proceedings.

4. Member States shall inform the Commission of the name and address of any body which might have relevant information on major accidents and which is able to advise the competent authorities of other Member States which have to intervene in the event of such an accident.

Article 17

Inspections

1. Member States shall ensure that the competent authorities organise a system of inspections, or other measures of control in order to ensure that operators meet their duties under this Instrument. Such inspections or other control measures shall be sufficient for a planned and systematic examination of the systems being employed for pipelines, whether of a technical, organisational or managerial nature, so as to ensure in particular:

— that the operator can demonstrate that he has developed appropriate performance measures to monitor the Pipeline Management System (PMS),

— that the operator can demonstrate that he has taken appropriate measures to prevent major accidents,

— that the operator can demonstrate that he has provided appropriate means for limiting the consequences of major accidents,

— that any data and information submitted, adequately reflects the conditions of the pipeline(s).

2. The system of inspection specified in paragraph 1 shall comply with the following conditions:

(a) there shall be a programme of inspections for all pipelines;

(b) following each inspection, a report shall be prepared by the competent authority;

(c) where necessary, every inspection carried out by the competent authority shall be followed up with the operator, within a reasonable period following the inspection.

3. The competent authority may require the operator to provide any additional information necessary to allow the authority fully to assess the possibility of a major accident and to determine the scope of possible increased probability and/or aggravation of major accidents, and to permit the preparation of a local emergency plan.

Article 18

Prohibition of use

1. Member States shall prohibit the use or bringing into use of any pipeline, or any part thereof where the measures taken by the operator for the prevention and mitigation of major accidents are seriously deficient.

Member States may prohibit the use or bringing into use of any pipeline, or any part thereof if the operator has not submitted the notification or other information required by this Instrument within the specified period.

2. Member States shall ensure that operators may appeal against a prohibition order by a competent authority under paragraph 1 to an appropriate body determined by national law and procedures.

CHAPTER IV: Information system and exchanges, reporting

Article 19

Information system and exchanges

1. Member States and the Commission shall exchange information on the experience acquired with regard to the prevention of major accidents and the limitation of their consequences. This information shall concern, in particular, the functioning of the measures provided for in this Instrument.

2. The Commission shall set up and keep at the disposal of Member States a register and information system containing, in particular, details of the major accidents which have occurred within the territory of Member States, for the purpose of:

(a) the rapid dissemination of the information supplied by Member States pursuant to Article 15, paragraph 1 among all competent authorities;

(b) distribution to competent authorities of an analysis of the causes of major accidents and the lessons learned from them;

(c) supply of information to competent authorities on preventive measures;

(d) provision of information on organizations able to provide advice or relevant information on the occurrence, prevention and mitigation of major accidents.

The register and information system shall contain, at least:

(a) the information supplied by Member States in compliance with Article 15, paragraph 1;

(b) an analysis of the causes of the accidents;

(c) the lessons learned from the accidents;

(d) the preventive measures necessary to prevent a recurrence.

3. The access to the register and information system shall be open to government departments of the Member States, industry or trade associations, trade unions, non-governmental organisations in the field of the protection of the environment and other international or research organisations working in the field.

Article 20

Reporting

Member States shall provide the Commission with a three-yearly report for pipelines covered by this Instrument in accordance with the procedure laid down in Council Directive 91/692/EEC of 23 December 1991 standardising and rationalising reports on the implementation of certain Directives relating to the environment. The Commission shall publish a summary of this information every three years.

List of Annexes

ANNEX I

APPLICATION OF THE INSTRUMENT

INTRODUCTION

1. This Annex applies to the carriage of dangerous substances by pipelines within the meaning of Article 2 of this Instrument.

2. Mixtures and preparations shall be treated in the same way as pure substances provided they remain within concentration limits set according to their properties under the relevant Directives given in Note 1, or their latest adaptation to technical progress.

Categories of substances

1.	VERY TOXIC
2.	TOXIC
3.	OXIDIZING
4.	FLAMMABLE (where the substance or preparation falls within the definition given in Note 2)
5.	HIGHLY FLAMMABLE (where the substance or preparation falls within the definition given in Note 2)
6.	EXTREMELY FLAMMABLE (where the substance or preparation falls within the definition given in Note 2)
7.	DANGEROUS FOR THE ENVIRONMENT in combination with risk phrases: (i) R50: 'Very toxic to aquatic organisms' (ii) R51:'Toxic to aquatic organisms'; and R53: 'May cause long term adverse effects in the aquatic environment'
8.	ANY CLASSIFICATION not covered by those given above in combination with risk phrases: (i) R14: 'Reacts violently with water' (including R14/15) (ii) R29: 'in contact with water, liberates toxic gas'

NOTES

1. Substances and preparations are classified according to the following Directives (as amended) and their current adaptation to technical progress:

— Council Directive 67/548/EEC of 27 June 1967 on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances[9],

— Council Directive 88/379/EEC of 7 June 1988 on the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations[10],

— Council Directive 78/631/EEC of 26 June 1978 on the approximation of the laws of the Member States relating to the classification, packaging and labelling of dangerous preparations (pesticides)[11].

In the case of substances and preparations which are not classified as dangerous according to any of the above Directives but which nevertheless are present, or are likely to be present, in the pipeline and which possess or are likely to possess, under the conditions found in the pipeline, equivalent properties in terms of major-accident potential, the procedures for provisional classification shall be followed according to the relevant Article of the appropriate Directive.

2. 'Flammable', 'highly flammable', and 'extremely flammable' in categories 4, 5 and 6 mean:

(a) flammable liquids:

substances and preparations having a flash point equal to or greater than 21 °C and less than or equal to 55°C (risk phrase R 10), supporting combustion;

(b) highly flammable liquids:

9 OJ No 196,16.8.1967, p. l. Directive as fast amended by Directive 93/105/EC (OJ No L 294,30.11.1993, p.2l).

10 OJ No L 187, 16. 7. 1988, p. 14.

11 OJ No L 206, 29.7.1978, p. 13. Directive as fast amended by Directive 92/32/EEC (OJ No L 154, 5. 6. 1992, p. 1).

1. — substances and preparations which may become hot and finally catch fire in contact with air at ambient temperature without any input of energy (risk phrase R 17),

   — substances which have a flash point lower than 55 °C and which remain liquid under pressure, where particular conditions, such as high pressure or high temperature, may create major-accident hazards;

2. substances and preparations having a flash point lower than 21 °C and which are not extremely flammable (risk phrase R 11, second indent);

(c) extremely flammable gases and liquids:

1. liquid substances and preparations which have a flash point lower than 0 °C and the boiling point (or, in the case of a boiling range, the initial boiling point) of which at normal pressure is less than or equal to 35 °C (risk phrase R 12, first indent), and

2. gaseous substances and preparations which are flammable in contact with air at ambient temperature and pressure (risk phrase R 12, second indent), whether or not kept in the gaseous or liquid state under pressure, and

3. liquid substances and preparations maintained at a temperature above their boiling point.

ANNEX II

STRUCTURE OF A MAJOR-ACCIDENT PREVENTION POLICY (MAPP) AND A PIPELINE MANAGEMENT SYSTEM (PMS) AS REFERRED TO IN ARTICLE 7

For the purpose of implementing the operator's Major-Accident Prevention Policy (MAPP) and Pipeline Management System (PMS) account shall be taken of the following elements:

(a) the Major-Accident Prevention Policy (MAPP) should be established in writing and should include the operator's overall aims and principles of action with respect to the control of major-accident hazards;

(b) the Pipeline Management System (PMS) should include the part of the general management system which includes the organisational structure, responsibilities, practices, procedures, processes and resources for determining and implementing the Major-Accident Prevention Policy (MAPP);

(c) the following issues shall be addressed by the Pipeline Management System (PMS):

(i) organisation and personnel — the roles and responsibilities of personnel involved in the management of major hazards at all levels in the organization. The identification of training needs of such personnel and the provision of the training so identified. The involvement of employees and, where appropriate, subcontractors;

(ii) identification and evaluation of major hazards — adoption and implementation of procedures for systematically identifying major hazards arising from normal and abnormal operation and the assessment of their likelihood and severity;

(iii) operational control — adoption and implementation of procedures and instructions for safe operation of the pipeline, including maintenance and temporary stoppages;

(iv) management of change — adoption and implementation of procedures for planning modifications to pipelines, including during the design of new pipelines;

(v) planning for emergencies — adoption and implementation of procedures to identify foreseeable emergencies by systematic analysis and to prepare, test and review emergency plans to respond to such emergencies;

(vi) monitoring performance — adoption and implementation of procedures and performance measures for the ongoing assessment of compliance with the objectives set by the operator's Major-Accident Prevention Policy (MAPP) and Pipeline Management System (PMS), and the mechanisms for investigation and taking corrective action in case of non-compliance. The procedures should include the operator's system for reporting major accidents or near misses, particularly those involving failure of protective measures, and their investigation and follow-up on the basis of lessons learnt;

(vii) audit and review — adoption and implementation of procedures for periodic systematic assessment of the Major-Accident Prevention Policy (MAPP) and the effectiveness and suitability of the Pipeline Management System (PMS); the documented review of performance of the Major-Accident Prevention Policy (MAPP) and of the Pipeline Management System (PMS) and its updating by senior management.

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ANNEX III

AREAS TO BE COVERED BY THE PIPELINE MANAGEMENT SYSTEM (PMS) SPECIFIED IN ARTICLE 7

I. Identification and accidental risks analysis and prevention methods

With respect to the essential requirements set out in II. below, the operator is under an obligation to

- identify possible major-accident scenarios and their probability or the conditions under which they occur including a summary of the events which may play a role in triggering each of these scenarios, the causes being internal or external to the pipeline;

- assess the extent and severity of the consequences of identified major accidents;

- provide appropriate technical measures and equipment for the safety of the pipeline.

In choosing the most appropriate solutions, the manufacturer must apply the principles set out below in the following order:

- eliminate or reduce hazards as far as is reasonably practicable,

- apply appropriate protection measures against hazards which cannot be eliminated.

II. Essential requirements

Pipelines which conform to European and international standards shall be presumed to conform to the essential requirements listed below in as far as the scope of these standards cover such requirements.

A. Design and construction of the pipeline

Dangerous substances shall not be conveyed in a pipeline unless it has been properly designed and constructed, taking all relevant factors into account, to prevent loss of containment that could lead to major accident.

B. Operation of the pipeline

Dangerous substances shall not be conveyed in a pipeline unless the safe operating limits of the pipeline have been established.

A pipeline shall not be operated beyond its safe operating limits.

C. Maintenance and inspection of the pipeline

Dangerous substances shall not be conveyed in a pipeline unless the pipeline and all equipment relevant to the safe operation of the pipeline is properly maintained and inspected and if necessary repaired so that the required function is safeguarded.

D. Prevention of third-party interference

Provision must be made for appropriate surveillance measures aimed at the prevention of third-party interference.

III. Measures of protection and intervention to limit the consequences of an accident

Dangerous substances shall not be conveyed in a pipeline unless an emergency plan has been established in compliance with Article 9 and Annex IV.1.

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ANNEX IV

DATA AND INFORMATION TO BE INCLUDED IN THE EMERGENCY PLANS SPECIFIED UNDER ARTICLES 9 AND 13

1. Emergency plans prepared by the operators

(a) Names or positions of persons authorized to set emergency procedures in motion and the person in charge of and coordinating the mitigatory action.

(b) Name or position of the person with responsibility for liaising with the authorities responsible for the local emergency plans.

(c) For foreseeable conditions or events which could be significant in bringing about a major accident, a description of the action which should be taken to control the conditions or events and to limit their consequences, including a description of the safety equipment and the resources available.

(d) Arrangements for providing early warning of the incident to the authorities responsible for setting the local emergency plans in motion, the type of information which should be contained in an initial warning and the arrangements for the provision of more detailed information as it becomes available.

(e) Arrangements for training staff in the duties they will be expected to perform, and where necessary coordinating this with local emergency services.

(g) Arrangements for providing assistance with mitigatory action.

2. Local emergency plans

(a) Names or positions of persons authorized to set emergency procedures in motion and of persons authorized to take charge of and coordinate action.

(b) Arrangements for receiving early warning of incidents, and alert and call-out procedures.

(c) Arrangements for coordinating resources necessary to implement the local emergency plan.

(d) Arrangements for mitigatory action.

(e) Arrangements for providing the public with specific information relating to the accident and the behaviour which it should adopt.

(f) Arrangements for the provision of information to the emergency services of other Member States in the event of a major accident with possible transboundary consequences.

ANNEX V

ITEMS OF INFORMATION TO BE COMMUNICATED TO THE PUBLIC AS PROVIDED FOR IN ARTICLE 15, PARAGRAPH 1

1. Name of operator and location of the pipeline(s).
2. Identification, by position held, of the person giving the information.
3. Confirmation that the pipeline is subject to the regulations and/or administrative provisions implementing this Instrument and that the notification referred to in Article6has been submitted to the competent authority.
4. An explanation in simple terms of the function of the pipeline(s).
5. The common names or the generic names or the general danger classification of the substances and preparations carried which could give rise to a major accident, with an indication of their principal dangerous characteristics.
6. General information relating to the nature of the major-accident hazards, including their potential effects on the population and the environment.
7. Adequate information on how the population concerned will be warned and kept informed in the event of a major accident.
8. Adequate information on the actions the population concerned should take, and on the behaviour they should adopt, in the event of a major accident.
9. Confirmation that the operator is required to make adequate arrangements, in particular liaison with the emergency services, to deal with major accidents and to minimise their effects.
10. A reference to the local emergency plan(s) drawn up to cope with any effects from an accident. This should include advice to co-operate with any instructions or requests from the emergency services at the time of an accident.

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ANNEX VI

CRITERIA FOR THE NOTIFICATION OF AN ACCIDENT TO THE COMMISSION AS PROVIDED FOR IN ARTICLE 16, PARAGRAPH 2

I. Any accident covered by paragraph 1 and having at least one of the consequences described in paragraphs 2, 3, 4 and 5 must be notified to the Commission.

1 **Substances involved**

Any fire or explosion or accidental discharge of a dangerous substance carried by a pipeline.

2. **Injury to persons and damage to real estate**

An accident involving pipelines and giving rise to one of the following events:

— a death,

— six persons injured and hospitalized for at least 24 hours,

— dwelling(s) damaged and unusable as a result of the accident,

— the evacuation or confinement of persons for more than 2 hours (persons x hours): the value is at least 500,

— the interruption of drinking water, electricity, gas or telephone services for more than 2 hours (persons x hours): the value is at least 1 000.

3. **Immediate damage to the environment**

— *permanent or long-term damage to terrestrial habitats:*

— 0,5 ha or more of a habitat of environmental or conservation importance protected by legislation,

— 10 or more hectares of more widespread habitat, including agricultural land,

— *significant or long-term damage to freshwater and marine habitats(*)*

— 10 km or more of river or canal,

— 1 ha or more of a lake or pond,

— 2 ha or more of delta,

— 2 ha or more of a coastline or open sea,

— *significant damage to an aquifer or underground water*[*]

— 1 ha or more.

4. **Damage to property**

— damage to pipelines, including the loss of substances carried, of at least ECU 2 million,

— damage to property other than pipelines of at least ECU O,5 million.

[*] In assessing damage, reference could be made where appropriate to Directives 75/440/EEC, 76/464/EEC and Directives adopted for its application in relation to certain substances, namely, Directives 76/160/EEC, 78/659/EEC, 79/923/EEC, or to the Lethal Concentration (LC) for 50 % of the species representative of the environment affected as defined by Directive 92/32/EEC for the criterion 'dangerous for the environment'.

5. **Cross-border damage**

   Any accident involving a pipeline giving rise to effects outside the territory of the Member State concerned.

II. Accidents or 'near misses' which Member States regard as being of particular technical interest for preventing major accidents and limiting their consequences and which do not meet the quantitative criteria above should be notified to the Commission.
