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# Assessment of requirements on safety management systems in EU regulations for the control of major hazard pipelines

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## Abstract

The European Commission has carried out a thorough review and assessment on whether pipelines conveying dangerous substances need a level of control similar to chemical installations, based on consideration of the hazards and risks and on accidents world-wide. The study examines whether sufficient controls already exist within the European Union (EU) Member States, considering the control philosophy of the 'Seveso II' Directive and the need to support development of pipeline networks across the EU taking into account the principles of sustainability. Community legislation would be supported by a set of criteria for the classification of Major-Accident Hazard Pipelines. Such criteria are examined for the onshore transmission pipelines in the EU. The Commission study has shown that there is a large variation in the degree to which Member States have comprehensive 'major-accident hazard' legislation on pipelines, and that existing legislation rarely addresses elements of the Safety Management System. The assessment, based on a proposed Pipeline Safety Instrument, indicates that there will be added value in a European Instrument drawing on the principles of Seveso II Directive concerning Safety Management System requirements. © 2000 Elsevier Science B.V. All rights reserved.

*Keywords:* Safety management systems; Hazardous pipelines; Major accident hazards; EU regulation

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## 1. Introduction

Transmission pipeline networks carry substances over long distances and across borders between European Union (EU) Member States and beyond. The routes are mostly through rural areas, but inevitably, they come closer to urban areas. People are not generally aware of the existence and the extent of the unseen networks, and are still less aware of the staggering volume of flow of the substances being conveyed.

It is EU policy to promote greater use of pipelines, including the development of European pipeline networks. Pipelines are considered a practical means for the carriage of very large volumes, and are generally recognised as the safest and most economical way of carrying dangerous substances [1]. A pipeline system, compared with road or rail transport, is a controlled system: it behaves in a predictable way, and for its operation, only a few parties are involved [2]. Historically, there has been a good pipeline safety record within the EU Member States and most of the ‘headline news’ pipeline accidents have been outside the EU.

External interference, mostly third party activity, is one of the main causes of natural gas and oil industry pipeline incidents. Corrosion or material/construction defects are also common causes of incidents, particularly in oil industry pipelines. Unlike chemical installations handling dangerous substances, pipeline networks are not contained within a perimeter controlled by an operator, and therefore, external interference is a major concern. There exist records of accidents with considerable consequences in Europe and worldwide, clearly indicating the pipeline ‘major-accident hazard’ potential. A review of accidents involving hazardous substances in onshore transmission pipelines is given in Ref. [3]. Fig. 1 presents the gravity of major accidents in fixed installations as reported

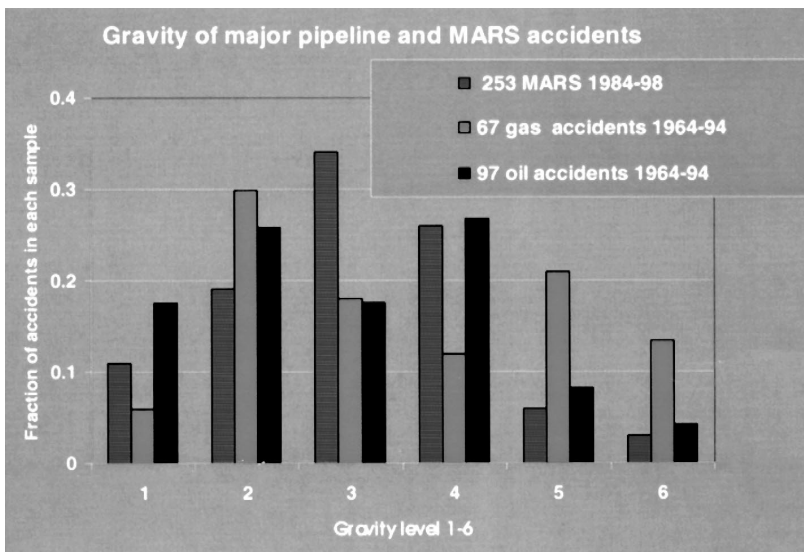


Fig. 1. Gravity of world-wide pipeline accidents in comparison with major accidents in fixed installations reported to the European Commission Major Accident Reporting System (MARS) [3,4,6].

in the European Commission Major Accident Reporting System (MARS) [4] in comparison with the gravity of pipelines accidents world-wide as referred to in other publication [3]. A six-level gravity scale proposed by a EC working group in the development of Seveso II Directive [5], was used to demonstrate that both gas and oil pipeline accidents may have consequences of similar scale to those in fixed installations.

A view that pipelines should be included within the scope of Community legislation dealing with major-accident hazards was expressed in the European Council during discussions of the Seveso II Directive 96/82/EC [7]. A temporary position evolved which continued to exclude the transmission of dangerous substances through pipelines from the scope of the Directive, but the Council and the European Parliament identified pipelines as an area with a potential to produce major accidents and called for a special study of this potential. In this respect, the Seveso II Directive states:

...whereas the (European) Commission should, after collecting and evaluating information about existing mechanisms within the Community for regulating such activities and the occurrence of relevant accidents, prepare a communication setting out the case, and most appropriate instrument, for action in this area if necessary.

The Commission carried out a thorough study (Review and Assessment) with the following main objectives:

- whether pipelines need a level of control similar to chemical installations, based on consideration of the hazards and risks and on accidents world-wide;
- whether sufficient controls already exist within the EU Member States, considering the underlying approach of the Seveso II Directive, and the need to support sustainable development of pipeline networks across the EU.

This study is mainly based on the following inputs:

- responses to a European Commission questionnaire (1996) on existing pipelines legislation within the Member States;
- 42 conclusions and 13 recommendations drawn up at a special OECD Workshop on pipelines, hosted by the Norwegian Authorities in Oslo in 1996, with the aim of exploring the International approach to the control of major-accident hazards associated with pipelines, including a review of pipeline accidents world-wide [8];
- conclusions and recommendations from an EC Workshop on pipelines, hosted by the German Authorities in Berlin in 1997, including detailed consideration of the content of a potential Pipeline Safety Instrument [9];
- review on pipeline accidents performed by the Commission [3,10];
- reports from other projects launched by the Commission on the potential scope of an EU initiative — in particular, on the criteria for the classification of major-accident hazard pipelines, on the essential safety performance measurements, and on the cost–benefit of a potential European regulatory instrument on the control of pipeline hazards.

- responses (from Member States and pipeline industry) to the so-called “Regulatory Benchmark” on existing national legislation and current industry practice on the control of major-accident hazards arising from pipelines [11]

This Commission study is currently at its second phase (see Section 2). The preliminary conclusions of the study have been presented to the Competent Authorities of the Member States and have been agreed. This paper summarises the main findings of the study, along with some personal views of the author (identified as such).

A summary of the EU initiative is presented in Section 2. In Section 3, the use of quantified criteria in the existing legislation is reviewed. Section 4 deals with the parameters commonly used to classify a hazardous pipeline as a Major-Accident Hazard Pipeline (MAHP); an example is further presented, for a list of hazardous substances covered under the Seveso II Directive and the MAHP criteria formally applied in one EU Member State. In Section 5, the preliminary conclusions of the Commission Review/Assessment are presented, as they came out of the analysis of the major part of the responses received from the Competent Authorities of the EU Member States, and national regulations and their requirements are examined in comparison with the proposed Pipeline Safety Instrument. Section 6 presents some conclusions and recommendations.

## **2. The EU Initiative**

An important conclusion of the Commission study was that several Member States do not have comprehensive ‘major-accident hazard’ legislation in place for pipelines, and therefore an EU initiative could improve the situation. An EU initiative would complete existing legislation, based on the ‘precautionary principle’, i.e. ensuring precautionary measures are taken with respect to potential accidents rather than reacting only after an accident has happened. This approach is not affected by uncertainties about risks involved and public perception, since pipeline risks are systematically studied and openly discussed in many countries. In cases where Member States have extensive legislation, any initiative should have the objective of ‘filling gaps’ without making it necessary to change existing national legislation which is satisfactory. Therefore, a particular focus for consultation has been to thoroughly explore the range of regulatory instruments that could achieve this objective.

The most appropriate type of possible EC Instrument for this sector and the possible content of an EC Instrument was discussed in detail in the Berlin workshop [9]. The workshop made a large number of recommendations related to what it is considered to be an ‘appropriate level of EU control’, which can be defined as ‘goal setting’ control measures. It was agreed to proceed with a ‘next consultation step’ comprising the preparation by Commission Services of a Regulatory Benchmark for the control of major-accident hazards involving pipelines (Pipeline Safety Instrument — PSI) which should serve as a basis for a self-assessment by the Member States, comparing their existing legislation against all Articles and Annexes of this benchmark [11]. An overview of European Community Policy on the control of major-accident hazards

arising from pipelines and of the European Commission Review/Assessment of existing legislation on pipelines within the Member States can be found in Ref. [12].

The proposed Instrument (PSI) is focused on onshore transmission pipelines, and is based on the principles of Safety Management Systems. The proposal is presented in Appendix A. It contains 20 Articles divided into four main categories:

- Aim, Scope, Definitions, Exclusions (Articles 1 to 4)
- Obligations of the operator (Articles 5 to 10)
- Duties of the Competent Authority (Articles 11 to 18)
- Information system, Reporting (Articles 19 to 20).

The operator is required to develop performance measures for his Safety Management System in co-operation with the Authorities. The Authorities will inspect 'performance' against the agreed measures.

The Regulatory Benchmark was sent to the members of the Committee of Competent Authorities (CCA) for the Seveso Directives, the list of delegates for the Berlin Workshop, and other interested parties. Federations and other bodies were invited to submit position papers on various issues, to be taken into account in the Commission review. Where existing national provisions contain a greater level of detail than the Regulatory Benchmark, Member States were asked to identify such details as 'performance measures'. The Member States and all interested parties were also requested to identify any significant omissions from the Regulatory Benchmark. In summary, the Commission wanted to get three types of information:

- where national legislation that is 'in compliance' with the Regulatory Benchmark exists: details of such legislation;
- where such national legislation does not yet exist but is envisaged: details of the content of the envisaged legislation and the time schedule for its adoption;
- where provisions contained in the Regulatory Benchmark are considered unnecessary or inappropriate: detailed reasons for such considerations.

Responses have been received by the Competent Authorities of the Member States, the EU pipeline industry including Marcogaz (EU Natural Gas operators), CONCAWE (Oil/Petrochemical), CEFIC (Chemicals), EIGA (Industrial Gases), E and P Forum (Offshore), UKOPA (UK Offshore), Gaz de France (Natural Gas), Gasunie (Natural Gas in The Netherlands), DEPA (Natural Gas Greece), MOL (Oil and Gas transportation business unit-Hungary), and other interested bodies including ECUI (Committee of Users Inspectorates), DETR (Department of the Environment, Transport and the Regions — Chemicals and Biotechnology, UK), DBE (Fire and Explosion Prevention — Norway)

The first assessment phase of the Regulatory Benchmark was completed in April 1999 and concerns the responses received from the Competent Authorities. The second assessment phase (not completed at the time of this publication) takes into account the inputs from industry and other bodies and the comments received in the second consultation phase of the Instrument with the Authorities. The information available was analysed in order to compare the provisions included in national regulations and

industrial practice with those proposed in the various Articles of the PSI. The preliminary results of the assessment performed, concerning onshore transmission pipelines, are summarised in Section 4.

### **3. Criteria for the classification of major accident hazards pipelines and Quantified Risk Analysis (QRA)**

National and Community legislation can be supported by the application of a number of criteria classifying pipelines as MAHP. Such criteria may include categories of dangerous substances, pipeline operation thresholds (such as pressure, diameter etc) and severity of consequences of potential accidents. Not all criteria used in EU Member States are always applicable or relevant to all EU pipeline networks for as long as the average life cycle of a Community legislative instrument would require. For instance, criteria related to the most important pipeline routes in a country, such as the main energy supply lines or the routes through particular vulnerable environments, may receive critical attention for a period of years because of priorities in national energy and land use planning policies.

There exist several approaches to assess the risk of pipeline transport to man and the environment. Risk assessment may be implicit or explicit, qualitative or quantitative, and need not always be a complex process; sometimes only a simple risk ranking, combining for instance the likelihood of an event and the severity of its outcome, may be adequate for purposes of prioritisation. Where criteria exist which require evidence that a pipeline is below some upper level of risk, the results of a full QRA are appropriately utilised. In the management of pipeline risk, QRA was not common among most EU countries. By tradition, standards and design rules applied to pipelines were ‘deterministic’ in their approach, to ensure safe operation without explicit reference to risk assessment. This is still the case in many EU countries, but some degree of risk assessment is now being increasingly introduced into design codes and legislation [13].

Quantified criteria may be still rare in the existing pipeline legislation in EU countries and the USA, but they are not uncommon in industrial practice. When they are applied, risk criteria provide support in a wide range of decision making, i.e. for the improvement of preventative and mitigating measures for pipelines already in operation, for selection among different pipeline routes at the design phase, etc. The application of risk based criteria requires a substantial amount of input data, mainly related to the release outflow, such as:

- failure type (pinhole, hole, full bore rupture);
- valve configuration;
- time for leak detection and response;
- length of pipe section, etc.

Moreover, the accident scenarios selected for consideration (usually the worst-case scenarios) require reliable data such as:

- the likelihood of release and hole size in various pipeline size-windows, failure causes, design factors, wall thickness, burial depths and pipe age;

- the likelihood of ignition for flammable substances (immediate or delayed) in various locations along the route of the pipe (including all network system functions such as pumping-valve-stations, etc) and with respect to the failure cause, and;
- the likelihood of a casualty in all vulnerable areas in the vicinity of the hypothetical accidental release (considering also the exposure time of an individual before being sheltered or evacuated).

The low failure and ignition frequencies obtained in onshore transmission pipelines [6,14–17], make QRA an attractive technique, since it allows the exclusion from consideration of events with a very remote likelihood. Numerous studies have been devoted to QRA applications in pipelines. Interesting conclusions on risk levels in several transmission pipelines can be found in [18,19]. In general, the objectives of risk assessment appear to be fully achieved when a specific section of a pipeline network is selected for examination e.g. a pipeline section already in operation routed through a number of identified developments between the receiving and delivery points [20].

The fundamental stages of a comprehensive safety analysis such as QRA (i.e. hazard identification, failure classification, event frequency estimation, consequence assessment, risk quantification etc.) can on their own constitute powerful tools for determining priorities for a number of preventative and mitigation actions in pipeline safety. Important information can be gained from the application of such tools when adequate and reliable data are processed. Uncertainty in the results are principally connected with the evaluation of the release outflow [21], but also with the ‘discretisation’ of a certain pipe section under examination [22]. When a ‘case-by-case’ analysis is performed, uncertainty in the results is expected to be lower because the input data are related to a specified pipeline with area vulnerability data also specified [20].

It is generally accepted that a ‘case-by-case’ analysis including full QRA is a systematic approach to obtain a comprehensive picture of risk levels involved in the selected sections of an extended pipeline network. For a number of characteristic transmission line sections such analyses can be found in the literature [19]. A similar approach when applied in a large transmission network with a range of different pipe sizes and operating conditions requires extensive studies.

#### **4. Major-accident hazard pipelines (MAHP)**

Among the key questions raised in the discussions on controls of hazards from pipelines is “what constitutes a MAHP?”. In dealing with extended pipeline networks conveying different hazardous substances, the criteria that can be used for the selection of MAHP should address aspects related to the identification of hazards and the assessment of consequences after a hypothetical failure of a pipe in all different networks under consideration. Such aspects include:

- properties of hazardous substances conveyed;
- importance and extent of the networks and volume of transported products;
- causes, frequency and severity of past pipeline incidents;

- type, volume and safety features of the containment (e.g. specified pipeline sections);
- possible consequences using theoretical event trees (discharge, dispersion, ignition, fire etc.) from a pipe failure, considering the release rate, extent of effects and fatality/pollution probability at a fixed location;
- land use in the vicinity of the networks; and
- individual or societal risk including event and casualty likelihood.

It is the author's opinion that a systematic approach for the selection of major-accident hazard pipelines (MAHP), should contain a set of criteria taking into consideration:

- the classification and qualifying quantities of hazardous substances (similar to the approach adopted by Seveso Directives);
- the type of reported pipeline accidents; and
- the type of transmission networks and design codes established in the EU countries.

A study in this area is under development in the Major Accident Hazards Bureau of the European Commission, and includes a methodological procedure based on the principles of the proposed Regulatory Benchmark. A consistent application of such a procedure is aimed at producing a number of useful indications for the selection of MAHP across EU. The procedure includes the following screening steps:

- Identification of all hazardous substance conveyed in EU networks;
- Importance and prioritisation of networks in operation in EU;
- Identification of substances (and quantities) involved in major pipeline accidents world-wide;
- Selection of minimum pipe inventory for a critical line sector;
- Selection of initiating events in connection to the design characteristics of the pipe;
- Evaluation of consequence distances for maximum credible scenarios; and
- Consideration of existing zoning criteria;

Some background information concerning the application of the first screening step of the above procedure is given in Section 4.1.

#### *4.1. Dangerous substances in EU pipeline networks*

Hazardous substances conveyed in the EU transmission networks mainly consist of Natural Gas, Crude Oil and Petroleum products. The most extensive pipeline network within the EU is for carriage of Natural Gas to local distribution. The European high pressure transmission grid<sup>2</sup> grew to a length of over 180 000 km, to which must be added over 1 000 000 km of low pressure distribution lines which provide for a natural

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<sup>2</sup> If we consider each pipeline sector containing 200 tonnes of natural gas as a Seveso site — 200 tonnes being the relevant (upper-tier) threshold — the high pressure (> 20 bar) natural gas network of EU corresponds to ~ 1800 Seveso sites.



gas consumption of over 300 billion  $\text{m}^3 \text{ year}^{-1}$ . There are great differences in the length of natural gas networks among the EU Member States. The major part ( $\sim 85\%$ ) of the entire EU grid is to be found in only five countries.

There are  $\sim 31\,000$  km of onshore “oil pipelines” in the EU used for the carriage of 635 million  $\text{m}^3 \text{ year}^{-1}$  of Crude Oil and refined Petroleum Products including gasoline, kerosene, diesel and heavy fuel oils. Most of those fuels are classified as dangerous to the environment with a risk phrase R51/R53 (see Table 1). The total traffic volume in the entire CONCAWE<sup>3</sup> grid is  $\sim 113$  billion  $\text{m}^3 \text{ km}$  today of which products amount to  $\sim 25\%$ , occupying  $\sim 70\%$  of the total length of the networks [23]. The major part of crude oil traffic takes place in France, Germany, Italy and that of products also in Spain and UK. Further references can be found in Ref. [6]. Other flammable, toxic, oxidising, and dangerous to the environment substances are also conveyed in EU networks of lesser extent. There exist  $\sim 10\,000$  km of “chemical pipelines” within the EU. These are mainly used for the carriage of Ethylene and Propylene, but shorter pipelines also carry dangerous substances such as Butadiene, Chlorine, Styrene and Ammonia (see Table 1).

The transmission of natural gas occupies the most extended grid in the EU ( $\sim 80\%$  of total EU), while crude oil and petroleum products are conveyed in networks with a combined length of less than 20% of EU natural gas; networks carrying other chemicals are even shorter ( $\sim 6\%$  of EU natural gas). Natural gas transmission is thus considered of much greater importance than other fluids in the context of the studies considered here. Oil pipelines are also important since the networks can be found in most of EU countries and have a history of many years. Pipelines carrying other chemicals are also considered within the context of a European regulatory instrument since the consequences of accidents involving such chemicals can be considerable.

Most of the hazardous substances, including preparations (mixtures), are classified under national legislation using classification systems developed for different purposes; consequently a variety of systems were applied in various countries [11]. A list of hazardous substances known to be conveyed by the pipeline networks in one characteristic EU country are presented in Table 1. The criteria for substance categories adopted in the Seveso II Directive have been considered as the base for the comparison with the classification criteria included in the legislation of the country concerned (used as an example). As seen in Table 1, not all ‘Seveso classified’ substances are covered by national provisions, since they may not fulfil the national MAHP criteria of that particular country. The question becomes more important with those substances, such as crude oil, classified as dangerous to the environment (see Table 1). A classification of substances in categories similar to those adopted in the Seveso Directive is proposed in the PSI [11].

If hazardous substances are to be classified in categories, a set of common criteria should be adopted across the EU. In the opinion of the author, the principles of the Seveso II type classification system can provide a sound basis for such a common approach. In any case, further study is needed to identify the gaps in the national

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<sup>3</sup> The Oil Companies’ European Organisation for Environment, Health and Safety.

Table 1

Criteria adopted by Seveso II Directive for classification of dangerous substances in comparison with MAHP criteria in the legislation of one EU country for transmission pipelines

Substance or Mixtures	Seveso II criteria * (category of substance)	Classifications (Risk Phrases) *	MAHP criteria fulfilled?
Acetone	Highly Flammable (7b)	R11	NO
Acrylonitrile	Toxic (2) Flammable Toxic to aquatic organisms	R45-23/24/25-38, Carcinogenic cat. 2 R11, (Named in Seveso I) R51/R53 (proposed)	YES
Ammonia	Dangerous for the environment (9i) Very Toxic to aquatic organisms	R50, R34-50 (Named in Seveso I)	YES
Aniline	Toxic (2) Very Toxic to aquatic organisms	R20/21/22-40-48/23/24/25 R50, Carcinogenic cat. 3	NO
Benzene	Toxic (2) Flammable	R45, R48/23/24/25 Carcinogenic cat.1,R11	NO
Butadiene	Named in Seveso II (liquefied gas) Extremely Flammable	R12, R45, Carcinogenic cat. 2	YES
Butane	Named in Seveso II (liquefied gas) Extremely Flammable	R12 Carcinogenic cat.2, R45 if Butadiene >0.1%	YES
Carbon Monoxide	Extremely Flammable (8) Toxic	R12 R23-48/23, R61	YES
Chlorine	Named in Seveso II	R23, R36/37/38, R50	Not conveyed
Crude Oil	Dangerous for the environment (9ii) Flammable	R52/R53 R12, Carcinogenic cat. 2, R45	NO (stabilised)
Cyclohexane	Highly Flammable (7b)	R11	NO
Ethane	Extremely Flammable (8)	R12	YES
Ethanol	Highly Flammable (7b)	R11	NO
Ethylene	Extremely Flammable (8)	R12	YES
Ethylene dichloride	Highly Flammable (7b)	R11, Carcinogenic2, R45, R22, R36/37/38	NO
Hydrazine	Toxic (2)	Carcinogenic cat.2, R45, R23/24/25, R34, R43, R10	NO
Hydrogen	Named in Seveso II - Ext.Flammable	R12	YES
Methane Natural Gas	Extremely Flammable (8) Named in Seveso II (liquefied gas) (in mixture)	R12  Probably R50 depending on components	YES
Methanol	Named in Seveso II Flammable, Toxic	R11, R23/25	NO
Nitric Acid	Oxidising (3)	R8, R35	YES
Oleum	Reacts violently with water (10i)	R14, R35, R37	YES
Oxygen	Named in Seveso II - Oxidising	R8	NO
Petroleum Products i.e. Gasoline Naphtha LBP	Flammable Toxic (depending on components) Dang. for environment (case-by-case) Named in Seveso II (petrol and spirits)	R10 or R12 R45, R38, R65 R51/R53 R12, R51/R53, R38/R65, R45 if Benzene >0.1%.	NO (?)
Phenol	Toxic (2)	R24/25, R34	NO
Propane LPG	Named in Seveso II (liquefied gas) Extremely Flammable	R12 R45 if Butadiene >0.1%	YES
Propylene	Named in Seveso II (liquefied gas) Extremely Flammable	R12	YES
Styrene	Flammable (6)	R10, R20, R36/38	NO
VinylChloride	Extremely Flammable	R12, Carcinogenic Cat.1, R45	YES
Xylene	Flammable (6)	R10, R20/21, R38	NO

\*Not all data and conditions are mentioned. Risk phrases according to classification adopted by Seveso II.

provisions regarding substance classification for all fluids conveyed in EU pipeline networks. The analysis of the information collected with the Regulatory Benchmark has shown that not all stakeholders consider substance classifications as most appropriate for a European pipeline regulatory instrument. The main reason given is that certain substances, such as natural gas, should be treated as ‘named substances’, since they are transported in much larger quantities than others, and the conditions for a possible accident are different from those in fixed installations.

## **5. Provisions in national regulations and the proposed Pipeline Safety Instrument (PSI)**

The information contained in the responses to the Regulatory Benchmark received from the Competent Authorities of the EU Member States, was analysed for each country and for each thematic area following the articles of the proposed Pipeline Safety Instrument (PSI, see Appendix A). Where a lack of ‘compliance’ of the national legislative provisions with the proposed PSI was identified, a statement was made in the Commission study. The list of statements developed addresses the gaps in the national legislation as identified by the Commission, and agreed with the National Authorities consulted. The study further includes a number of ‘Attention Points’ which embody the most important statements made and the main comments of the Authorities concerning the proposed PSI overall. Attention Points thus address:

- Provisions included in the PSI and not fully covered in the national regulations;
- omissions from the PSI identified by the Authorities;
- differences in approaches between the PSI and the national regulations, and
- other limitations of national legislation as recognised by the Authorities.

A summary of ‘general statements’ and ‘attention points’ included in the Commission study for a selected number of representative EU Member States is given below. An overview of the preliminary assessment performed by the Commission for 12 EU Member States is given in Table 2. All statements and conclusions presented here are included in the Commission study. This Commission study has been presented to and endorsed by the Authorities of the Member States.

The articles of the proposed PSI are listed in the left column of Table 2, and are described in Appendix A. To make Table 2 easy to read, three types of symbols are used:

- (√) Provisions included in PSI article are fully covered by national law
- (■) Provisions included in PSI article are partially covered by national law; the coverage is considered marginally sufficient by the Commission study
- (NO) Provisions included in PSI article are either partially covered by national law but the coverage is not considered sufficient by the Commission study, or provisions included in PSI article are not covered by national law.

As seen in Table 2, the vast majority of gaps in national legislation around Europe are connected to the requirements for a Major Accident Prevention Policy, the imple-



mentation of a Safety Management System, the provision of information to the public, information exchange and accident reporting. On the other hand, the obligations of the operator, including notification and preventative measures against external interference, are in general covered by existing regulations. Moreover, it is apparent that substantial differences exist among the provisions in the various EU Member States, as the selected statements from Member State S1 to S5 and S7 show:

### *5.1. Member state S1*

#### *5.1.1. General statements*

Regulations and technical standards govern industrial practice. The definitions of ‘major accident’ and ‘risk’ do not exist and the concepts of Major Accident Prevention Policy (MAPP) and Safety Management Systems (SMS) are not included in national regulations. There is no regulatory mechanism connected to inspections, land use planning and accident reporting.

#### *5.1.2. Attention points*

- A substantial number of requirements are not included in the national provisions
- The Competent Authority questions whether an emergency plan should be developed and information to the public should be provided along the entire pipeline and not only around the most important point of the network
- The Competent Authority believes that a “free-will” European regulation can be of added value.

### *5.2. Member state S2*

#### *5.2.1. General statements*

There is a good overall match between the PSI and the provisions despite the fact that the national approach is in principle different than the approach followed in the PSI. Extensive legislation exists on pipeline transportation of gaseous substances, liquid or liquefied hydrocarbons, brine, caustic soda, waste liquids and gaseous Oxygen. Distribution and in-field gathering lines are also covered. Safety precautions include safe operating conditions, provisions on consultation and information for works in the vicinity of pipelines and declaration of public utility including an obligation to consult every private property owner. Definitions of risk, major accident and hazard are not explicitly mentioned in regulations; risk analysis is not foreseen. Municipalities play a central role in the management of the consultation procedures and the distribution of information to the public. Precautions include visual markers, protection zones, periodic surveillance, emergency plans, maintenance, repairs and inspections by authorities and officially recognised supervisory bodies.

#### *5.2.2. Attention points*

- Regulations exist for fuels and named substances such as Oxygen (not substance categories)

- Definitions of “risk”, “hazard” and “major accident” do not formally exist
- Requirements on MAPP and SMS are indirectly met but not as in PSI; the Competent Authority believes that it would be of benefit if such requirements were to be directly mentioned in national legislation
- Risk analysis is not common practice; the Competent Authority believes that risk analysis will neither provide for more safety than a careful routing and zoning policy, nor will serve new constructions in highly populated regions; on the contrary existing pipelines will probably need re-routing
- There is no obligation to supply information on a permanent basis to people liable to be affected by a major accident
- Obligations of the operator for internal emergency planning, and information after an accident (except on damage) are not explicit
- Protection distances in a zoning system are connected to residential areas, developments and traffic routes in the vicinity of pipelines
- The Competent Authority questions whether there will be any added value in a European Regulatory Instrument based on the criteria of the Seveso Directive; pipelines should be regulated with a different approach than the one adopted by the Seveso Directive for fixed installations because pipelines are not a point in the map.

### 5.3. Member state S3

#### 5.3.1. General statements

There exist provisions for the majority of the requirements proposed in the PSI, despite the fact that the national approach is in principle different from the approach followed in the PSI. A hazardous pipeline is defined in broader terms than under PSI. Industrial practice is largely governed by statutory requirements, i.e. laws and regulations but above all by technical standards and codes of practice. Rules and technical standards become legally binding when a regulation or Act refers to them. It is assumed that pipelines transporting hazardous substances are safe if the Acknowledged Rules of Technology were applied. National regulations refer to the natural gas, flammables, hazardous to water and toxic and caustic gases. In the existing legislation, the operator's own responsibility is emphasised.

QRA is not foreseen in the industrial practices and the official position argues whether such analyses should be under a legal requirement. Detailed notification procedures exist in connection to project planning and implementation phases, including requirements related to key safety elements, such as: routing, technical standards, mechanical calculations, special crossing, accompanying safety devices, inspection and testing plans and certifications. Implementations of MAPP and SMS consist of monitoring the safety performance through regular inspections.

Marking of the pipeline route by markers posts and regular inspections are considered by the Authorities as the countermeasures against third-party interference. Regulations do not prescribe any safety distances as a function of the population density in the zone. In fact, the official position argues whether requirements on fixed safety distances, under a possible European regulatory instrument, would be at all practicable for both existing

networks and new projects. There is no specific requirement that information be officially reported. The Competent Authority questions whether it is practical to provide information to the public along the entire grid of pipelines.

### 5.3.2. Attention points

- An extensive natural gas and oil (mainly crude oil) transmission pipeline network has been in operation for many years
- The control of hazards is carried out through detailed technical rules
- Substances which are toxic or dangerous to the environment are examined as hazardous to water; The Competent Authority believes that substances dangerous to the environment should be further defined
- Definitions on risk and major accident do not exist in national legislation
- Small and long lasting leaks are covered by national legislation while they are not included under the definition of major accident in the PSI
- The Competent Authority believes that SMS requirements should not be strongly prescriptive and should not imply approaches not foreseen by the national system
- There is no control of Third Party Interference through an obligatory Information System
- Safety (protection) distances are not related to the existence of residential areas in the vicinity of pipelines but depend on the design properties of the pipe; design factors and pipe thickness do not relate to the existence of residential and vulnerable areas
- There is no obligatory reporting and information to the public
- Competent Authority and national pipeline industry believe that a European Regulatory Instrument is not necessary

## 5.4. Member state S4

### 5.4.1. General statements

The Competent Authority believes that:

- Substances like Oxygen should be considered in a European Regulatory Instrument
- Thresholds related to the dimensions of the pipelines, the operating pressure, the type of product, the maximum quantity contained etc., should define the applicability of a potential instrument
- The philosophy of a potential Instrument should be based on the criteria and requirements of the Seveso II Directive

## 5.5. Member state S5

### 5.5.1. General statements

There is a compatibility in principle between the PSI and the provisions in national regulations based on the development of a Safety Study and an Emergency Plan. In fact,

the national approach shows certain similarities to the approach adopted in the PSI. Regulations are divided into three main themes linked to different substance categories: combustible gas (natural gas), liquid or liquefied hydrocarbons, and chemical products.

The Competent Authority believes that the classification of dangerous substances is most important and special attention should be paid to the definition of the ‘substances dangerous to the environment’. Concerning the emergency plan of the operator, it should be considered that the population in the linear zones around pipelines is not like the population around a fixed installation. The permanent display of information to persons liable to be affected by a major accident may create problems. The concepts of risk and hazard are not formally defined. The obligations of the operator are clearly established in law including notification requirements.

A classification (in three zones) according to population densities along the pipeline route determines the safety factor for the construction of the pipe. For the laying of pipes in such zones it is necessary that pipe construction (safety factors, wall thickness, etc.) follow predetermined criteria. Systematic inspection and control measures in respect to major accident hazards arising from pipelines are not regulated.

#### *5.5.2. Attention points*

- An extended natural gas, oil and toxic substances pipeline network has been in operation for many years
- The concepts of risk and hazard are not formally defined in regulations
- Requirements related to the MAPP and SMS do not exist
- Systematic inspection and controls in relation to major accident hazards are not regulated
- The safety factors and pipe thickness are calculated according to surrounding residential and vulnerable areas

The Competent Authority believes that:

- A European Regulatory Instrument should respect the subsidiarity principle, should be of an indicative character, and should be accompanied by relevant guidelines
- the domain of application of such an instrument is important (specified pressure, diameter, length thresholds)
- attention should be paid to the definition of substances dangerous to the environment
- the permanent display of information to persons liable to be affected by a major accident may create problems
- the criteria for accident notification proposed in PSI should be re-examined

#### *5.6. Member state S7*

##### *5.6.1. General statements*

There is a reasonable match between the PSI and the national legislation, because new legislation in 1996 was framed within a goal-setting framework, very much like



PSI. However, according to the Competent Authority the environmental aspects are not equally considered. Existing legislation does not cover environmental effects to the same extent as the PSI (specifically concerning the control of major accident hazards); the relevant legislation focuses on specific licenses and authorisations, as opposed to actual duties.

The concepts of risk and hazard are well established in law and health and safety practice. The obligations of the operator are clearly established in law. The principle of ALARP-reducing the risks to levels as low as reasonably practicable-is established as a fundamental. For internal emergency planning, the law places a duty on the operator to provide information to the local authority but there are no detailed emergency planning requirements for operators to follow particularly in connection with environmental damage.

The Authority believes that communicating information to the public is an issue that needs further consideration recognising the significant number of public along all pipeline networks. The display of information relating to emergency plans in public and the communicating of safety-related information in general is an aspect for wider discussion, particularly focusing on defining those people who are liable to be affected by the consequence of a major accident. No requirement exists for an information system in connection with the prevention of third party interference. For the major accident hazard pipelines notified, the authority calculates case-by-case and sets consultation distances applying modern risk assessment techniques.

A classification is made of the population density along the proposed pipeline route in order to determine a maximum design factor for the pipe. The pipe wall thickness is calculated according to the hoop stress equation; increasing the wall thickness is preferred to other forms of protection against external impact.

### 5.6.2. Attention points

- An extended natural gas, oil (mainly oil products), and toxic substance network is in operation for many years
- No specific provision for an operator to establish performance measures
- Requirements on SMS are referred to in supporting guidance to the national law
- The law does not set out the detailed emergency planning requirements for operators to follow
- Local emergency planning in connection to environmental damage is not in the law
- There is no specific requirement for the public to be informed
- Environmental aspects are treated through licensing and not by actual duties
- Consultation distances are calculated case-by-case through risk assessment techniques
- The safety factors and pipe thickness are calculated according to surrounding residential and vulnerable areas

The Competent Authority believes that:

- A straight read-across from Seveso II to PSI is not appropriate; a European Regulatory Instrument will be of added value particularly on environmental aspects

- The identification of dangerous substances should be further clarified; ‘dangerous to the environment’ is not well defined in the PSI (e.g. terrestrial environment, accumulation of slow undetected leak are not considered)
- Transmission/distribution and major accident hazard pipelines should be clearly defined; in-field gathering lines are included in the national legislation
- Information to the public is a matter of discussion; Who are the people who are liable to be affected by the consequence of a major accident?
- List of performance measures (standard industrial practice) should be illustrative and not prescriptive
- Documentation requirements should be simplified

## **6. Conclusions and recommendations**

The extent of natural gas and hazardous liquids pipeline networks in the EU varies substantially from country to country. External interference, mostly third party activity involving interference using machinery, has been recognised as a dominant failure mechanism both in gas and oil-industry pipelines. Existing legislative provisions for the control of major-accident hazards arising from pipeline transportation of hazardous substances do not address the elements of the Safety Management System established by the pipeline operator.

The Commission study has shown that there is a large variation in the degree to which Member States have comprehensive ‘major-accident hazard’ legislation on pipelines, varying from well developed systems in some countries to little or nothing in others. General obligations of the pipeline operator such as notification of the planned network are currently regulated in most of the EU Member States. Requirements, however, related to the a Major Accident Prevention Policy and its implementation through an appropriate Safety Management System, similar to those contained in the Seveso II Directive, are scarce in the existing legislation all around Europe. In some cases, the number or list of substances covered is not extensive and some important preventative measures such as prevention of third-party damage are not always explicitly covered. Definitions of risk, hazards and of major accident are not explicitly mentioned in regulations and Risk Analysis is not foreseen in EU practice. The Competent Authorities in many Member States do not have sufficient duties and operators are not obliged to carry out hazard identification or risk assessment under existing laws. In addition, mitigation measures such as information to the public, internal and local emergency planning, land use planning, accident reporting and exchange of information related to pipeline hazards are not always fully covered.

A European Regulatory Instrument based on requirements related to Safety Management Systems is under consideration for the control of major-accident hazards involving pipelines. The assessment performed by the European Commission to compare existing legislation against the proposed PSI and to assess the necessity of such an Instrument has indicated that there is added value in a European Instrument and on environmental aspects in particular.

The Commission study includes a list of general and detailed recommendations regarding the type and contents of a potential European Regulatory Instrument. The recommendations are still in a preliminary form and are currently under final revision. The main recommendations address the following:

- A European Regulatory Instrument should
  - have the status of a Directive and as such should respect the subsidiarity principle
  - be based on the principles of Seveso II Directive
  - not include prescriptive requirements
  - have a clear and defined application domain taking into account the size and pressure of pipelines
  - include obligations of the operator and duties of the authority in relation to the issues mentioned in the proposed PSI (see Appendix A)
  - directly mention requirements on MAPP and SMS; implementations of MAPP and SMS may consist of monitoring the safety performance through regular inspections
  - include specific provision for an operator to establish performance measures
  - include provisions for the control of Third Party Interference under a centralised Information System, etc.

Finally, a European Regulatory Instrument can be supported by appropriate technical guidelines on issues needing further elaboration such as:

- identification of dangerous substances categories and definition of substances dangerous to the environment
- small and long lasting leaks
- criteria for accident notification, etc.

## **Appendix A. The main issues addressed in the PSI (the annexes of PSI are not included)**

### *Chapter 1. Aim, scope, definitions, exclusions*

#### *Article 1. Aim*

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

### *Article 3. Definitions*

For the purposes of this Directive: 1. ‘pipeline’ shall mean a pipe or a pipeline system 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 stations, such as compressors and pumping stations, and any other equipment that is an integral part of the pipeline and all equipment relevant to the safe operation of the pipeline; 2 ‘operator’ shall mean . . .

### *Article 4. Exclusions*

This Directive shall not apply to the following: (a) pipelines conveying natural gas with an operating pressure less or equal to . . . ; (b) in-field gathering lines covered by Directive 92/91/EEC of 3 November 1992; (c) pipelines within establishments as defined by Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances.

## *Chapter 2. 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 Directive.

### *Article 6. Notification*

1. Member States shall require the operator to send the competent authority a notification within the following time-limits:
  - for new pipelines, a reasonable period of time prior to the start of construction or operation,
  - for existing pipelines, one year from the date laid down in Article . . .
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 of the pipeline(s).

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 at the date of entry into force of this Directive, notification under paragraph 1 is not required.

*Article 7. Major-Accident Prevention Policy (MAPP) and Safety Management System (SMS)*

1. Member States shall require the operator to draw up a document setting out a Major-Accident Prevention Policy (MAPP) and to establish a Safety Management System (SMS) to ensure that it is properly implemented. The Major-Accident Prevention Policy (MAPP) and the Safety Management System (SMS) 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 Safety Management System (SMS) for implementing it have been put into effect in accordance with the structure set out in Annex ... and covering the areas set out in Annex ...
3. Member States shall require that the operator establishes performance measures for monitoring the Safety Management System (SMS) in accordance with the principles contained in Annex II and covering the areas set out in Annex ...
4. The document setting out the Major-Accident Prevention Policy (MAPP) and a description of the Safety Management System (SMS) including the associated performance measures must be made available to the competent authority upon request.

*Article 8. Modifications to or abandonment of a pipeline*

In the event of a significant modification of a pipeline, any significant increase to the operating limits or significant change in the nature or physical form of the dangerous substance carried which could have repercussions on major-accident hazards, or in the case of abandonment of a pipeline, the Member States shall ensure that the operator: shall notify the competent authority referred to in Article 11 in advance of the modifications or the abandonment, and where necessary, reviews and revises the Major-Accident Prevention Policy (MAPP) and the Safety Management System (SMS).

*Article 9. Emergency planning*

1. Member States shall ensure that, for all pipelines covered by this Directive:
  - (a) the operator draws up an emergency plan containing the information set out in Annex ... ,
  - (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 minimise the effects, and to limit damage . . . ,
  - implementing the measures necessary to protect man and the environment from the effects of major accidents,
  - communicating the necessary information to the services or authorities and to the public 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 five 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 3. 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 Directive 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 routing of their pipeline(s), all third parties, prior to undertaking any underground work in the vicinity of pipelines, to use the information system in order to inform themselves of the exact routing of the pipeline(s) to follow instructions of the

pipeline operator 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 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 Directive, the authorities designated for that purpose by the Member State draw up local emergency plans containing the information set out in Annex ... 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 minimise the effects, and to limit damage to ... ,
  - implementing the measures necessary to protect man and the environment from the effects of major accidents,
  - communicating the necessary information to the services or authorities and to the public 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 five years. The review shall take into account ...
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.
2. 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 Directive 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 in order to establish a high level of protection for people.
  3. 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 Directive. The information shall be reviewed and repeated every five years and, where necessary, updated, at least if there is any modification within the meaning of Article 8. It shall also be made permanently available to the public concerned. Such information shall contain, at least, the information listed in Annex . . .
2. Member States shall, with respect to the possibility of a major accident with transboundary effects originating from a pipeline covered by this Directive, provide sufficient information to the potentially affected Member States so that all relevant provisions contained in Articles 13 and 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 . . . which have occurred within their territory. They shall provide it with the following details . . .
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 Directive. 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 Safety Management System (SMS),
  - 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 Directive 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 4. 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 Directive.
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 . . . . .: 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 Directive 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.

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