EUROPEAN INDUSTRIAL EMERGENCY PLANNING, AN EXAMPLE OF PRIVATE-PUBLIC PARTNERSHIP: ANOTHER FRENCH PARADOX ?

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ABSTRACT

Diverse and very close to the national specificities, the "industrial risk cultures" have been for the first time harmonized with the publication of COMAH (for Control Of Major Accidents Hazards) European directives in 1982 and 1996.

Through their implementation, these Seveso-named directives generated the first common prevention and emergency planning basis.

After risk assessment and scenario modelling, the company is directly responsible for in-plant emergency planning. Prevention methods and safety procedures have to be prepared, tested and registered by the internal safety departments.

If an accident occurs, the off-site planning has to run, under the leadership of policy makers. Strategy, coordination and control of different public agencies are keys of crisis management.

Over these 15 years-old process, the aim of the paper is to describe how it is possible to do more than regulation requirements, with a good private-public partnership (industrial company-public EM services), with technical means and advanced technologies.

KEYWORDS: Control Of Major-Accidents Hazards, European directives, Emergency planning, Major accident prevention policy, GIS, public-private partnership, Hydrocarbons fire, French provincial fire and rescue service, TOTAL Company

INTRODUCTION

National crisis management regulations in Europe have been constantly revised since World War II.

Technical and legislative evolution can be considered now after 60 years hand-in-hand development. Citizen exigencies also played a great deal of influence to this important process of social risk assessment.

France also followed this new way of safety management and the proposed communication will focus on shared experiences between industrial companies and fire and rescue services, based on the same success objectives.

EUROPEAN RISK ASSESSMENT AND EMERGENCY PLANNING, LEGAL FOCUS

It has been recognized for many years that certain industrial activities involving dangerous substances have the potential to cause accidents. Some of them give rise to serious injury to people or damage to the environment both close to, and further away from, the site of the accident. Such incidents have come to be known as **major accident hazards.**

European Directives

Historically diverse and very close to the national specificities, the "industrial risk cultures" have been for the first time harmonized with the publication of the first COMAH (for Control Of Major-Accidents Hazards) European directive in 1982[1].

The first objective of these regulations was to deal with a double concern:

- Begin to give an answer for controlling the major industrial risks after a decade of severe accidents which have brought a collective sentiment of "unsafety", even if media treatment of these catastrophic (or not) incidents was involved. In fact, at the end of the seventies after the first petroleum crisis, the ecological trend settled in Europe, taking his roots in Germany. Aim for more safety, seems to be linked to this tendency, with once again, the part played by Medias and the television's power improvement.
- The second idea was to harmonize the industrial safety regulations in the (very) heterogeneous and young Europe, and through this new kind of regulation, to draw the first inventory of the major accidents risks establishments in Europe.

Eight years later, in 1996, a second directive comes out to complete the prevention, control and mitigation of industrial major accidents[2], introducing new concepts[5,6] as land use and cumulative effects of different dangerous goods.

The dispositions of this supranational regulation are now enforced all over Europe. Main principle is the setting out of two levels of requirements for concerned establishments:

- For the "lower tier", the operator must draw up a document setting out his Major-Accident Prevention Policy (MAPP). The document is intended to give an overview of how the operator ensures a high level of protection for man and the environment. The document should take account[3] of the principles contained in Annex III of the Seveso II directive in the following seven areas:
    - ❑ organization and personnel
    - ❑ identification and evaluation of major hazards
    - ❑ operational control
    - ❑ management of change
    - ❑ emergency planning
    - ❑ monitoring performance
    - ❑ audit and review

- For the "upper tier" establishments, the operator is required to demonstrate in a **safety report** that a MAPP and a Safety Management System (SMS) for implementing it have been put into effect in accordance with the directive requirements.

The Safety Report

It is also a document provided by the industrial company containing a description of the establishment to enable the control authorities to have a clear picture of its purpose, location, activities and hazards. Facing to accident scenarios, services, technical equipment and processes for safe operations must be registered. The guidances[4] of the directive consider the following items to be explained:

- Management and organization
- Location
- Lay-out of the establishment
- The environment and surroundings of the establishment
- Dangerous substances
- Hazardous installations and activities
- Services

The regulations require that the operator of a “high risk” establishment produces two plans:

- an **on-site emergency plan**, which is prepared by the operator, to specify the response to an emergency which may affect those who work on the site;
- an **off-site emergency plan**, which has to be prepared by the local authority which specifies the coordinated response of partner agencies to an emergency which has **any** off-site effects.

On-Site Emergency Plan

Under the Prefect (State highest civil servant in provincial administration) control, industrial companies are in France responsible since 1985 for their own internal planning, which was in fact created by the first Comah directive. Based on risk assessment and scenario modelling, this in-plant-emergency planning has to be submitted to prefect services and fire and emergency services. After this step, the approbation of authorities confers to this first level of planning a good place in the national mitigation strategy of industrial accidents.

To give good complementarities with the external planning, requirements and contents have been defined, by the administration at first, and then by professional network[7] .Moreover, the processes of safety task sharing have been improved, between public fire and emergency services and company safety teams. Although professional cultures are different, these safety procedures have been largely taught, for more than a decade, in the French fire officer academy, and in crisis training sessions by petrochemical companies.

These facts and crisis management standards were the starting-up of a quite obligatory relationship between fire and rescue services and the operator.

Off-Site Emergency Plan

In France, the Prefect is responsible for emergency planning, especially for industrial off-site plan.

If an accident occurs, he ensures that emergency services take account of people directly involved in the crisis, reporting to government. The Prefect is the authority in charge of strategy, coordination and control of different public services such as fire services, police, medical service and cities technical services: in name of the central government, he’s the policy maker.

EMERGENCY PLANNING, ON-FIELD AND OPERATIONAL FOCUS.

Illustrating the complementarities of public and private means, we want to show what is really used on field, if an accident takes place.

Our approach is characterized by “joined-up” partnership and professionalism that is reflected in our contingency planning and has been carefully built up over the years. This ensures robust incident management through pre-planning, execution of the scenario, to a thorough debrief and beyond.

FIGURE 1. Crisis management center

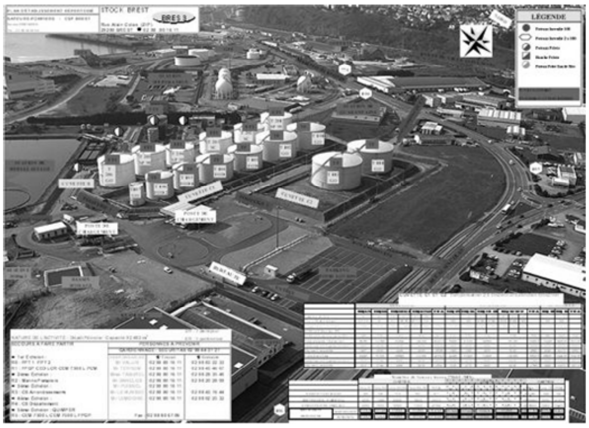


FIGURE 2. Oil storage pre-planning

We plan, prepare and train thoroughly with partners, holding regular exercises covering a wide range of potential scenarios. All this is done to a set of agreed protocols and compliance to the appropriate legislation, but which remain flexible and adaptable to cover almost any eventuality.

Achievement of shared objectives, and our own corporate vision, means we have to be able to respond to all foreseeable challenges, as well as deal with the inherent risks that may occur in our operating area.

For twelve years, French Fire and Rescue Services have been developing and using computerised planning, based on GIS software. Over the good way for appliances, these tools allow data integration such of the two emergency planning levels, list of dangerous goods, specific hazards, care and operational procedures, identity of operator correspondent [see appendix 1].

Immediately used in the call-center, different informations are also available on tablet PC, for the fire commander[8]. The resources of these e-documents are, of course, useful for the incident commander: population involved; environmental data; water supplies; chemical risks; industrial organisation and strategic contacts in the company management. The reporting through a command car appliance, takes place in GIS environment and data transmission to headquarters.

The cartography provided by the engineering industrial services allows a strong connection between the risk management and industrial processes.

In case of hydrocarbons fire, the use of updated and shared data between the two main actors of emergency management is very useful. In fact the calculations of the foam quantity, the water supply dimensions can be prepared and stored on Gis software[9]. On the field of the fire, it's easier to agree on technical approach and to have a real collaboration on the fight.

The integration of virtual reality (VR) technology with traditional geographical information systems and tools for managing emergency procedures is particularly interesting from both a decision support and training perspective. A VR interface could either replace a conventional 2D interface or complement it, depending on user requirements.

Studied for ten years[10,11] VR technology can be indifferently used by companies and industrial operator or fire and EM services to associate on the same basis through a G.I.S, all data needed in the safety management system, in a global planning. Moreover, VR technology enables users to really interact with three-dimensional data, providing a potentially powerful interface to both static and dynamic information.

Since large amounts of spatial and temporal data can be presented directly to the user, it should be possible to improve overall situation awareness using a well-designed VR user interface to an emergency management system.

One of the many benefits of adopting a virtual reality-based approach within an integrated fire command training system is that command at both the tactical and operational levels can be combined within exercises with a high degree of realism. Join sessions allows industrial manager and public safety actors to train together, without interfering to industrial processes.

Finally, VR enable all exercise activities to be recorded for post-exercise analysis and comment. Consistency of training doctrine is promoted by adopting a computer-based approach which incorporates local operational procedures and local and international best practice. VR scenarios could incorporate advanced technology for simulating typical activities specific to oil and gas fires, such as drenching systems and foam blankets.

At last, the experimentation this year of robotic units in toxic and radioactive atmospheres, allows our services to have benefits of non human resources, in accident imaging (IR or visual), in toxic or irradiative measurements. The use of such remote apparatus is also expected in fight against Cbrn terrorism.

FIGURE 3. Virtual reality scenes

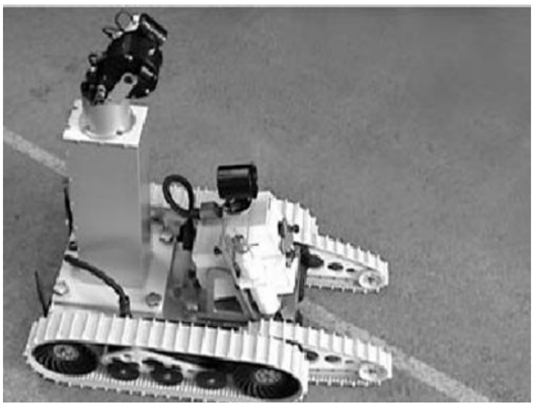


FIGURE 4. CBRN survey robot

REFERENCES

Regulations and Guidances

1. Council Directive 82/501/EEC of 24 June 1982 on the Major-accident Hazards of Certain Industrial Activities (Amended), OJ n° L 230, p. 1, 5.8. 1982.
2. Council Directive 96/82/EC of 9 December 1996 on the Control of Major-accident Hazards Involving Dangerous Substances (Amended), OJ n° L 10, 14.1.1997, p. 13-33.
3. Mitchison, N. and Porter S., “Guidelines on a Major Accident Prevention Policy and Safety Management System, as Required by Council Directive 96/82/EC (Seveso II)”, Rapport EUR 18123 EN, Office des Publications Officielles de la Communauté Européenne ed., Luxemboug, 1998.
4. Papadakis, G.A. and Amendola, A., “Guidance on the Preparation of a Safety Report to Meet the Requirements of Council Directive 96/82/EC”, Rapport EUR 17690 EN, Office des Publications Officielles de la Communauté Européenne, Luxemboug, 1997.

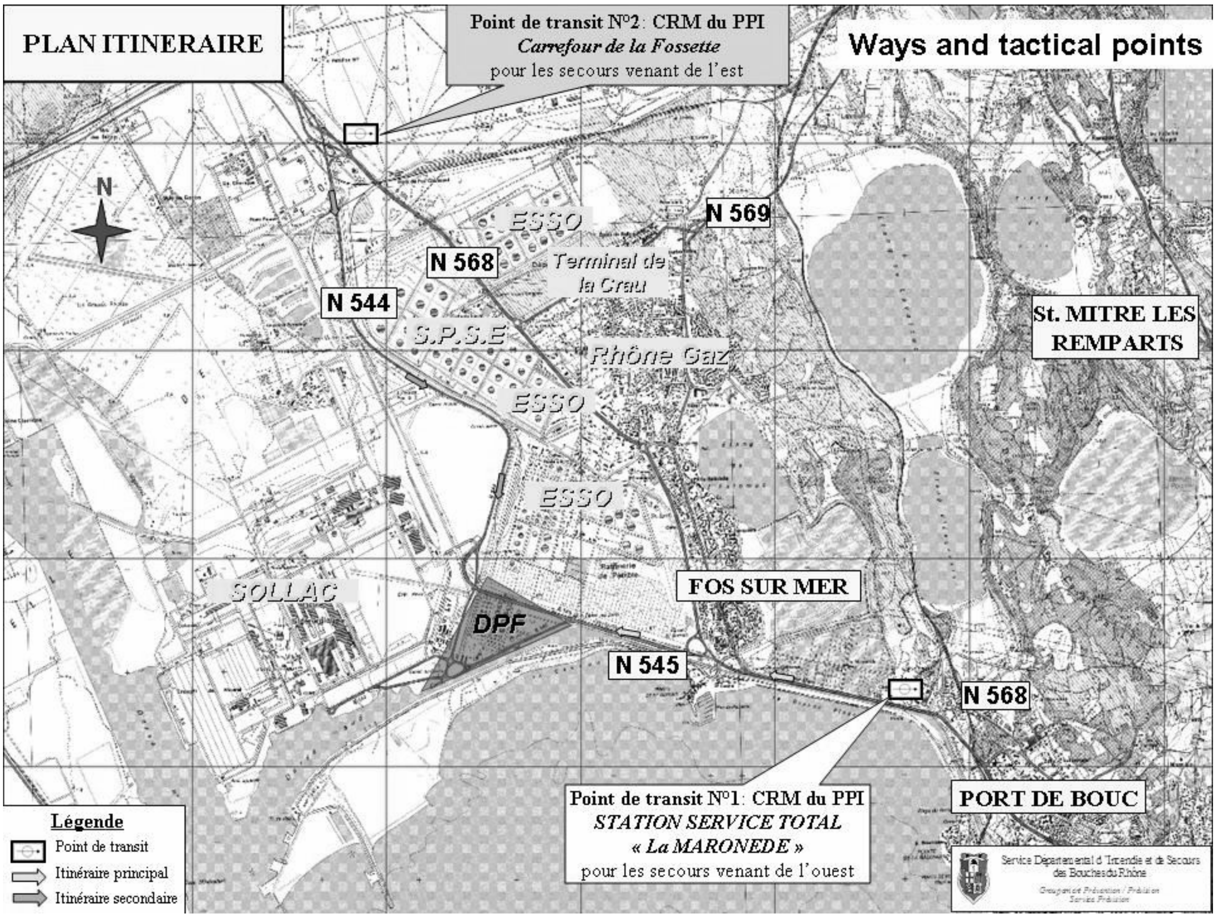
Papers and Communications

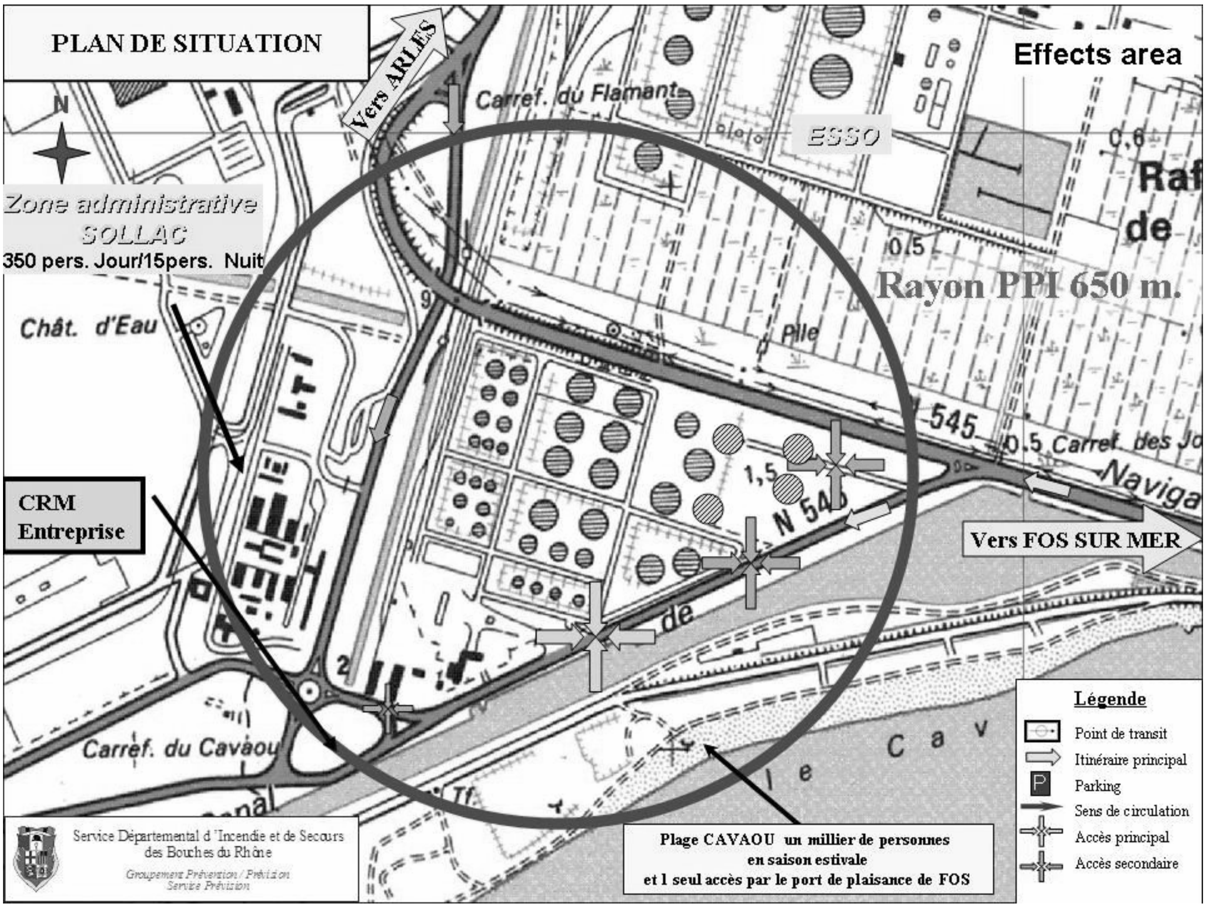
5. Mitchison, N. and Clémenté C., “Safety Management Systems in the Seveso II Directive”, in Safety and Reliability, pp. 121-125, Proceedings the European Conference on Safety and Reliability – ESREL 98, Lydersen, Hansen, Sandtorv, Balkoma ed., Rotterdam, 1998.
6. Wittig, J., Porter, S., Clémenté, C. and Kirchsteiger, C., “Major Industrial Accidents Regulation in the E.U”, in Journal of Loss Prevention, 12:1, 19-28, Amsterdam, janvier 1998.
7. Ouvrage Collectif, Rapport Guide méthodologique du GESIP pour l’élaboration d’un P.O.I. d’un site industriel : raffinerie, usine chimique, complexe pétrochimique , 96/01 , GESIP ed., Paris 1996.
8. Helschger G., Ostiante-Decanis G., Vitalbo M., Broquier J., Monet J.P. and Jorda L., “Supports Informatiques d’aide à la Decision”, in Le sapeur-pompier n°929, p. 26 à 29, Fnspf edit., Paris, novembre 2001.
9. Helschger G., “Planification face aux feux d’hydrocarbures”, Report for Study of Master “Prévention des risques naturels et technologiques”, Université d’Aix-Marseille II ed., Marseille, juin 2002.
10. Clavaud, E. and Verneuil, L., “Apports de la réalité virtuelle à la formation de la gestion des risques”, colloque des départements IUT Hygiène Sécurité Environnement, Niort, 6-8 juin 2007. http://uptv.univ-poitiers.fr/web/canal/44/theme/38/manif/148/index.html
11. Daniel, T. and Mahoudo, H., “Système d'Information Géographique - Planification d'urgence”, Communication à la conférence francophone d’ESRI, Issy-les-Moulineaux, 5 et 6 octobre 2005. http://www.esrifrance.fr/sig2005/communications2005/SDIS_29/SDIS_29.htm

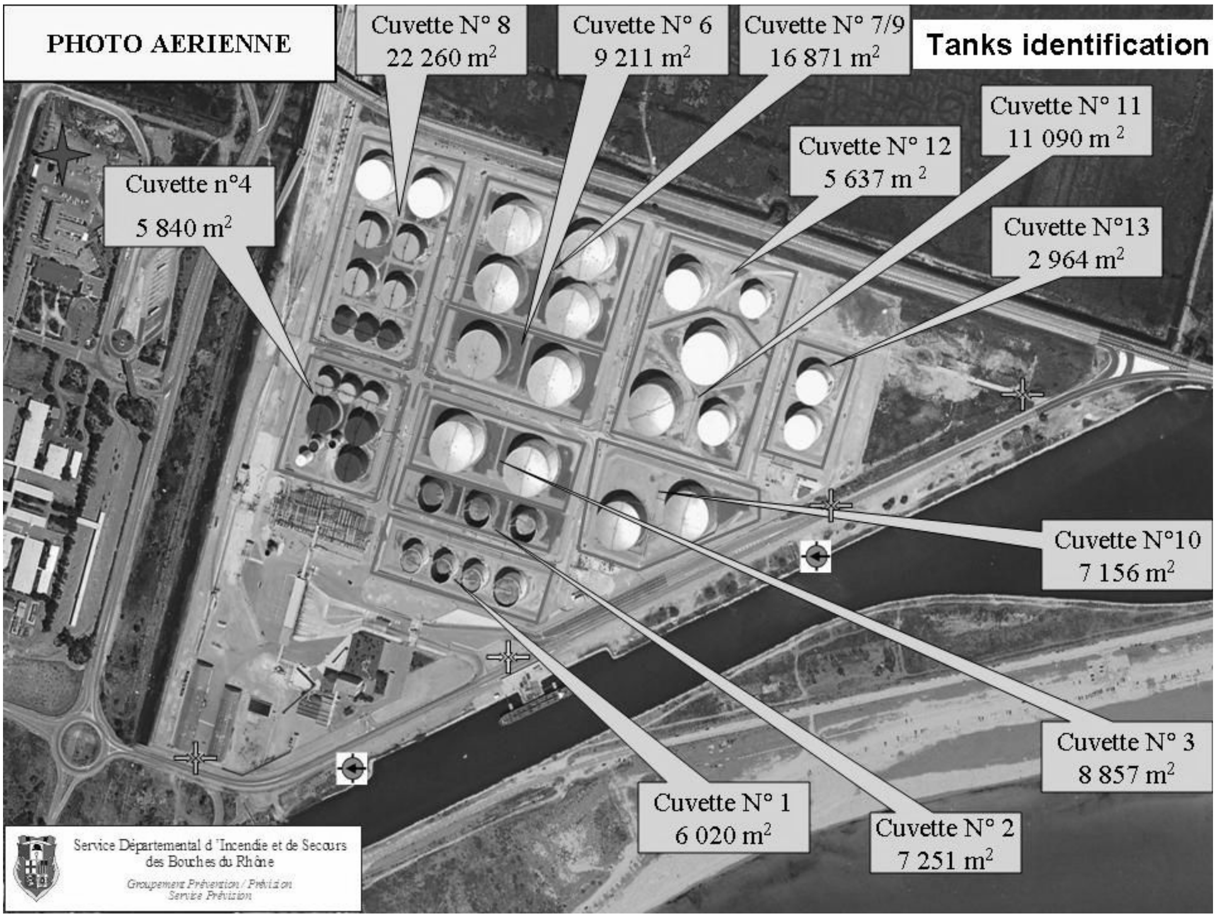
Appendix 1 : abstracts of DVD dedicated to the facility

Front page

Situation page


PLAN ITINERAIRE
Point de transit N°2: CRM du PPI
Carrefour de la Fossette
pour les secours venant de l'est
Ways and tactical points
N
ESSO
N 569
N 568
Terminal de la Crau
N 544
S.P.S.E
Rhône Gaz
ESSO
ESSO
St. MITRE LES REMPARTS
SOLLAC
FOS SUR MER
DPF
N 545
N 568
Point de transit N°1: CRM du PPI
STATION SERVICE TOTAL
« La MARONEDE »
pour les secours venant de l'ouest
PORT DE BOUC
Légende
Point de transit
Itinéraire principal
Itinéraire secondaire
Service Départemental d'Incendie et de Secours des Bouches du Rhône


PLAN DE SITUATION
Vers ARLES
Carref. du Flamant
ESSO
Effects area
N
Zone administrative
SOLLAC
350 pers. Jour/15pers. Nuit
Rayon PPI 650 m.
Chât. d'Eau
Pile
545
Carref. des Jo
Naviga
CRM
Entreprise
N 545
Vers FOS SUR MER
Carref. du Cavaou
Légende
Point de transit
Itinéraire principal
Parking
Sens de circulation
Accès principal
Accès secondaire
Service Départemental d'Incendie et de Secours des Bouches du Rhône
Groupement Prévention / Prévision
Service Prévision
Plage CAVAOU un millier de personnes
en saison estivale
et 1 seul accès par le port de plaisance de FOS



DONNEES HYDRAULIQUES / EMULSEUR

Cuvettes N° 1-2-3

Foam data

DPF

CUVETTE N° 1					
Bac / Sous cuvette	R10	R11	R12	R13	Total cuvette
Type	TF	TF	TF	TF	
Nature	Essences	Essences	Essences	Essences	
Volume BAC m³	9481	6046	6060	6055	27642
Hauteur max. BAC m	15.2	15.2	15.2	15.2	
Surface S/cuvette nette m²	1899	1176	1176	1770	6021
Temporisation (60min)					
Quantité d'eau (m³)	536	332	332	499	1698
Quantité émulseur (m³)	34	21	21	32	108
Débit total (L/Min)	9495	5880	5880	8850	30105
Extinction (20min)					
Quantité d'eau (m³)	357	221	221	333	1132
Quantité émulseur (m³)	23	14	14	21	72
Débit total (L/Min)	18990	11760	11760	17700	60210

DPF

CUVETTE N° 2				
Bac / Sous cuvette	R20	R21	R22	Total cuvette
Type	TFE	TF	TF	
Nature	Méthanol	Essences	Essences	
Volume BAC m³	9492	9496	9493	28481
Hauteur max. BAC m	15	15	15	
Surface S/cuvette nette m²	2618	2043	2590	7251
Temporisation (60min)				
Quantité d'eau (m³)	1107	576	730	2414
Quantité émulseur (m³)	71	37	47	154
Débit total (L/Min)	19635	10215	12950	42800
Extinction (20min)				
Quantité d'eau (m³)	738	384	487	1609
Quantité émulseur (m³)	47	25	31	103
Débit total (L/Min)	39270	20430	25900	85600

DPF

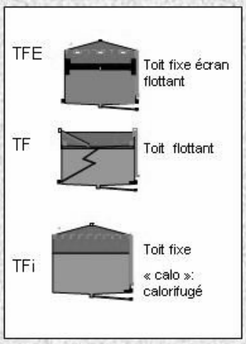
CUVETTE N° 3			
Bac / Sous cuvette	R30	R31	Total cuvette
Type	TFi	TFi	
Nature	Essence	Gasoil	
Volume BAC m³	37077	41359	78436
Hauteur max. BAC m	20	20	
Surface S/cuvette nette m²	4428	4428	8856
Temporisation (60min)			
Quantité d'eau (m³)	1249	1249	2497.392
Quantité émulseur (m³)	80	80	159.408
Débit total (L/Min)	22140	22140	44280
Extinction (20min)			
Quantité d'eau (m³)	832	832	1664.928
Quantité émulseur (m³)	53	53	106.272
Débit total (L/Min)	44280	44280	88560

Légende des tableaux : DONNEES HYDRAULIQUES / EMULSEUR

1) Base de calcul :

TA (Taux d'application) : 10 litres / m² / min
Concentration : 6%

Temporisation (60min)		
Quantité d'eau (m³)	Quantité	d'eau nécessaire à la temporisation pour 1 heure
Quantité émulseur (m³)	Quantité	d'émulseur nécessaire à la temporisation pour 1heure
Débit total (L/Min)	Débit	Débit de solution moussante nécessaire à la temporisation
Extinction (20min)		
Quantité d'eau (m³)	Quantité	d'eau nécessaire à l'extinction pour 20 minutes
Quantité émulseur (m³)	Quantité	Quantité d'émulseur nécessaire à l'extinction pour 20 minutes
Débit total (L/Min)	Débit	de solution moussante nécessaire à l'extinction




D.P.F.
Dépôts Pétroliers de Fos / Explosion d'un bac à toit fixe / Cuvette 7
Bac 70
Bac 71
Modelised scenario
263 m
107 m
Surpression de 170 mbars
Surpression de 50 mbars


D.P.F.
Dépôts Pétroliers de Fos / Explosion d'un bac à toit fixe / Cuvette 7
Modèle IT 89
Modèle Lannoy-EDF
Modelised scenario
173 m
134 m
Flux Thermique 5kW/m²
Flux Thermique 3 kW/m²