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# MAPPING OF THE RISKS OF THE GAS (CE 211) SKIKDA TRAVELLING CENTRE

BY

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**Abstract.** Methods and risk analysis, including risk mapping, are tools used to argue the decisions concerning the issue of operating licenses, control of urbanization and making of emergency plan. Mapping is a method of representation and prioritization of risks in organization. It is an essential component of the process of risk management. Its objective is to provide a statement of overall vulnerability places for all fields of activity. The mapping process is important because it raises the overall risk identification, assessment and prioritization. It offers simple and didactic representations, giving an overview for policy makers to guide their strategic choices of action. The cards are then used to track the effectiveness of the strategies implemented and finally determine a very effective communication tool on the inventory. The overall objective of the study is to assess the problems to be solved in risk management. A well done APR process (Preliminary Hazard Analysis) makes a decisive contribution to risk management, that is to say, cost control, project deadlines related to the achievement of product performance or service. Particularly, the APR approach must identify and assess risks, identify and quantify the possible scenarios and elaborate an action plan.

**Key words:** hazard, risk, mapping, assessment.

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## 1. Introduction

A mapping is a way of risks representing and prioritizing in an organization. It is an essential component of the risk management process. Its goal is to have a State of the art (entity, System) global vulnerability for all fields of activity. The mapping approach is paramount because it raises the general census of the risks, their assessment and their hierarchy. It offers simple and didactic performances, giving an overview to policymakers to guide their strategic choices of action. The cards are then used to track the effectiveness of the strategies implemented and finally form a very relevant tool of communication.

## 2. Travelling of the Gas Centre (CE 211)

The packer centre CE 211 is located 2 Km East of the capital of Skikda province near the industrial zone. CE 211 spreads over a total area of 50120 $m^2$. (See figure 1). CE 211 is considered as the most important part of the unit (NAFTAL DISTRICT LPG). Its objective is the packaging and marketing of LPG. It is intended to meet the gas needs of the population (Moulaire, 2007).

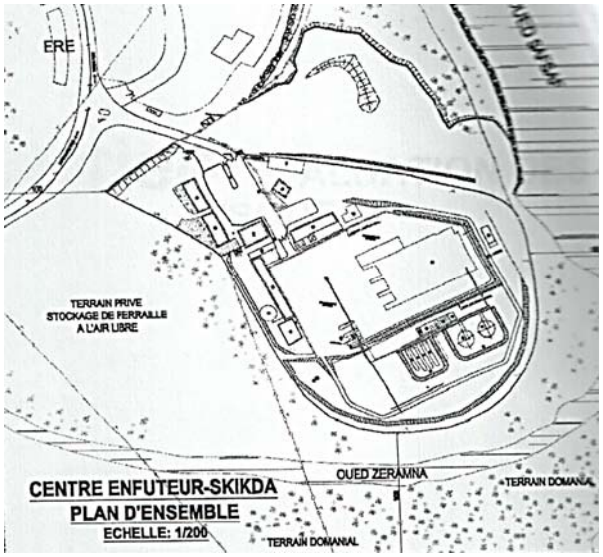


Fig. 1 − Centre plan.

### 2.1. The Storage

CE 211 Skikda is equipped with two spheres butane with a unit capacity of 1.023 $m^3$ and four cigars of propane including (see figure 2):

• two units having a capacity of 150 $m^3$;

• a unit of 154 $m^3$;
• a unit with capacity equivalent to 100 $m^3$.

Fig. 2 − Storage spheres and cigars.

### 2.2. The Fillig

#### **2.2.1** *Truck Loading Area*

The packer centre 211 Skikda has three loading station, each equipped with an articulated metal arm. (See figure 3).

Fig. 3 − Bulk loading area.

#### **2.2.2** *The Filling Hall*

The hall is equipped with two carousels of filling bottles of 13 kg butane (see figure 4), each consisting of 24 posts from filling to mass flow meters and a chain of filling of 35 kg propane cylinders.

Fig. 4 − Carrousel.

### 2.3. Filling of Cylinders Method

From the unloading dock (in bulk or pallet), the bottles are directed to two carousels using rolling chains driven by electric motors. But before their destination, the bottles pass through a very important step: the yard. The officer who is responsible for this operation has for mission to sorting the B13 to determine valid bottles and without danger, which will be aimed at filling. Discarded bottles will be classified according to the following cases:

- Bottles for re-test: If the last re-test has been achieved since 5 years or the age of the bottle reaches 5 years from the date of manufacture;
- Change of valve: If the valve is damaged or represents a deformation any it should be changed;
- Repair and paint: recovery, welding and painting.
- Reform: cylinders which are no longer valid for filling (swollen or deformed bottles) are proposed for reform (Lakaichi, 2013).

## 3. Risks Analysis

To develop a risk mapping we chose an APR (preliminary risk analysis) approach, this approach is not intended to go into the details but rather to quickly highlight the big problems likely to be encountered on the studied system. This analysis is generally conducted on the very beginning of the system design (Metayer & Hirsch, 2007). Analysis is based on two processes. The first is the identification of dangerous situations in order to develop the cartography of dangerous situations. For this first phase one should describe the system, identify the hazards and identify the dangerous situations. The second phase is the analysis of scenarios, to establish rating scales, to identify accident scenarios, to evaluate and treat the initial risks, to evaluate and manage the residual risk. The result will be cartography of risks by danger and by system elements.

## 4. Risks Quantification

Generally, a risk is moving in a two-dimensional space, consisting in the probability of its occurrence and the severity of its effects. This fact allows defining its criticality, a number resulting by the product of the probability by gravity. These are the essential parameters that define a risk, or, more specifically used for its characterisation. This is not always a simple multiplication between easy to calculate numbers.

Risks «characterization», then their \"hierarchy\" looks like the diagram below. Acceptability areas roughly shown on the diagram are refined to derive (DESROCHES et al, 2006).

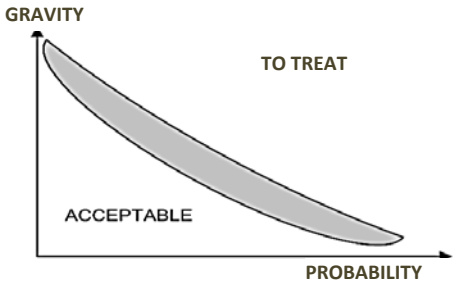


Fig. 5 − Area of risk acceptability.

## 5. Analysis of the Risks of CE 211

### 5.1. Analysis of Dangerous Situations

#### 5.1.1. *Definition of Systems and Subsystems*

Storage:

- cigars
- piping LPG
- retention
- pumps and gas compressors
- bottles
- loading trucks to deliver

The filling area:

- Hall of filling bottles B13
- handling of the pallets by forklift
- Hall of re-test bottles B13
- marshalling bottle B13

Transport area:

- discharge
- parking
- movement within the centre

- loading and unloading
- parking
- unloading diesel fuel
- parking area

Workshops :

a. Maintenance:
   - vulcanization wheels
   - battery charger
   - floor
   - pit of visit for vehicles auto
   - repair
   - pumps and compressor change strainer network
   - fire
   - air
   - electrical repairs

b. Welding:
   - archery
   - torch oxy
   - preparation and machining of parts

Administration:

- block administrative
- storage of spare parts and other
- health safety and security:
- portals for accessing downtown
- booths for guarding
- industrial safety waste.

### **5.1.2.** *Risks Identification*

*Physical risks*: factors of moods (noise, light, temperature), exposure to ionized and non-ionized radiation, machines and vibrating tools, other (dust, vapours, aerosols).

*Chemical risks*: toxic, corrosive, irritating, allergenic.

*Risk of infection, parasitic*: care activity (personal health), manipulations spoils, and gardening.

*Contact wastewater risks and constraints linked to work situations*: constraints visual, mental workload, work on screen, working with optical instrument (microscope), postural constraints (standing, knees).

*Accident hazards*: risk of falls, dangerous machinery, mobile machinery and lifting appliances, electrical hazard, fire, explosion, chemical burns, thermal burns, acute toxicity (inhalation), working height, risk suffocation, mass flight.

**5.1.3.** *Mapping of Hazardous Situations*

You can map the dangerous situations using a mapping table that has on the first line systems and subsystems (Table 1) and on the first column the identified risks (Table 2).

**Table 1**

*The header mapping table of hazardous situations*

| ***Storage*** | | | | ***Filling*** | | | | | ***Transport*** | | | | ***Workshops*** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Spheres & Cigars* | *Pump station* | *Pipes* | *Tank trucks* | *Filling hall* | *Loading truck station* | *Unloading station* | *Bottles* | *Workers* | *Warehouseman* | *Traffic* | *Conveyers* | *Drivers* | *Electricians* | *Repairers* | *Welders* | *Mechanics* |

**Table 2**

*The first column of the mapping table of hazardous situations*

| ***Generic danger*** | ***Specific danger*** | ***Dangerous occurrence*** |
|---|---|---|
| ***PHYSICAL RISKS*** | ***Ambient factor*** | *Noise +85 dB* |
| | | *Light* |
| | | *Temperature* |
| | ***Ionizing and non-ionizing radiation*** | *Optic Radiations UV - IR* |
| | | *Electromagnetic Radiations* |
| | | *Ionizing Radiations* |
| | ***Machines and vibrating tools*** | *tool hands* |
| | | *engines* |
| | | *fixed installations* |
| | ***Other*** | *Dust* |
| | | *Smoke* |
| | | *Aerosols* |

On the intersection of lines and columns you can find the priorities of treatment that have been prioritized as follows: 1: priority; 2: lower priority (see figure 5).

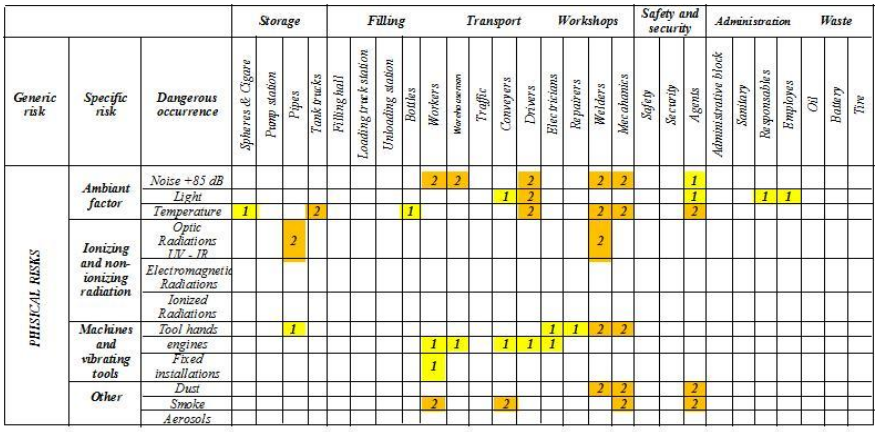


Fig. 6 − Mapping of the dangerous situations of the centre.

### 5.2. Analysis of Scenarios

After the identification of scenarios, it quantifies and it all summarized in a table, putting in header (see table 3). The first column summarizes the scenarios assigned to systems (see table 4).

**Table 3**

*The header of the quantification of the scenarios table*

| **Exposure level** | | | **Gravity NG** | | | | | **Criticality NR** |
|---|---|---|---|---|---|---|---|---|
| **F** | **M** | **I** | **NG1** | **NG2** | **NG3** | **NG4** | **NG5** | |

**Table 4**

*First column of qunatification table*

| **Area or subsets** | **Risk sources** | **Impact** |
|---|---|---|
| Cigars | Gas leak | Cold shock death of the operator fire, explosion |
| | Intervention on cigars | Fall of full foot, trauma, death |
| | Exposure to direct sunlight | Burst, leak, fire, explosion |

The quantification of the scenarios is qualified to be a kind of mapping (see figure 7).

| Fields of application | Perimeter or subsets | Risk sources | Impact | Exposure level NE | | | Gravity NG | | | | | CRITICALITY NR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | F | M | I | NG1 | NG2 | NG3 | NG4 | NG5 | |
| STORAGE Butane bulk | Cigars (12 and 13) | Gas leak | Cold shock death of the operator fire, explosion | X | | | | | | | X | C3 |
| | | Intervention on cigars | Fall of full foot, trauma, death | | X | | | | | X | | C3 |
| | | Exposure to direct sunlight | Burst, leak, fire, explosion | | | X | | | X | | | C2 |
| | | Valves and fitting flanges GPL | Fire and explosion | X | | | X | | | | | C1 |
| | Piping GPL | Static electricity | Fire and explosion | | | X | X | | | | | C1 |
| | Dyked | Look for discharge of stormwater | Fall of full foot, fracture tibia and chevès | | X | | | | X | | | C2 |
| | Pumps and gas compressors | Mechanical seals | Fire, burn | X | | | X | | | | | C1 |
| | | Electrical Equipment | Electric shock, electrocution Burns, fire | | | X | | X | | | | C2 |
| | | Power valves | Headache, dizziness fire, explosion | X | | | X | | | | | C1 |
| STORAGE Butane conditioning B13 and propane P35 | Bottles | Exposure to direct sunlight | Loss of product· fire, explosion | | | X | | X | | | | C2 |
| | | Faucets | Fire, explosion | X | | | X | | | | | C1 |
| | | Travel, manual uprisings of bottles (P35) | Low back pain and kidney pain of effort towers, tendonitis | | X | | | X | | | | C1 |
| | Loading area Delivery trucks | Markup of movement | Traffic injury accidents, disability | X | | | | | X | | | C2 |

Fig. 7 − Scenarios mapping.

## 6. Results

Preliminary analysis of risk allowed identification in the centre finds 37 high-risk situations of priority 1, 77 of priority 2 and 78 scenarios. Among these 78 scenarios, 32 have criticality C2 and 4 have criticality C3.

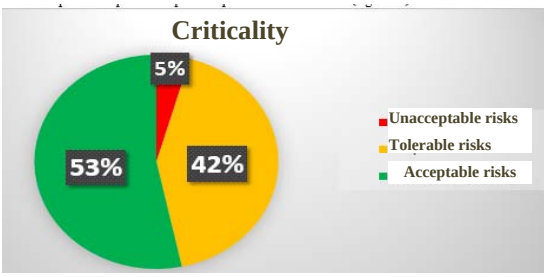


Fig. 8 − Criticalities repartition.

## 7. Conclusions

After the applied analysis on the CE 211 centre, one has a global vision of the system to better understand its complexity and an anticipation of the problems that you may encounter, must have a huge and effective contribution in the development of a plan of action for the reduction of risks.

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## CARTOGRAFIEREA RISCURILOR CENTRULUI DE DISTRIBUTIE SKIKDA

(Rezumat)

Metodele de analiză a riscurilor sunt instrumente utilizate pentru a argumenta deciziile privind eliberarea de licențe de operare, controlul urbanizării și elaborarea planului de urgenţă, aceste instrumente incluzând și cartografierea riscurilor. Cartografierea este o metodă de reprezentare și prioritizare a riscurilor într-o organizație, constituind o componentă esenţială a procesului de gestionare a riscurilor. Obiectivul său este de a oferi o imagine de ansamblu asupra vulnerabilităților în toate domeniile de activitate. Procesul de cartografiere este important deoarece permite identificarea riscurilor, evaluarea și prioritizarea acestora. cartografierea oferă reprezentări simple, sub formă de hărți, creând o imagine de ansamblu pentru factorii de decizie politică în scopul unor alegeri strategice de acţiune. Hărtile sunt apoi utilizate pentru a urmări eficienţa strategiilor implementate şi, în cele din urmă, constituie un instrument eficient de comunicare. Obiectivul general al studiului este de a evalua problemele de management al riscurilor. Un proces de APR (analiza riscurilor preliminare), corect realizat contribuie decisiv în managementul riscului, permițând controlul costurilor şi a deadline-urilor proiectelor care determină performanţa unui produs sau serviciu. În mod special, abordarea APR trebuie să identifice şi să evalueze riscul; identificarea şi cuantificarea scenariilor posibile şi elaborarea unui plan de acţiune.