Formalized Approach in Prevention through Design and Detailed Definition of the Input Data on the Basis of Occurred Accidents: Some Experiences at Italian Extractive Activities

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A SHORT “ADVERTISEMENT”

Occupational Safety and Health Research Group at Politecnico di Torino

Extractive activities and Accessory plants
a computer assisted technique to the S&H problems
in a Prevention through Design approach

Responsabile Scientifico per il Politecnico di Torino Prof. Ing. Mario Patracco
Responsabile Scientifico per la Provincia di Torino Ing. Pier Franco Ariano
ACCIDENT SEVERITY RATE OF FATAL/NON FATAL INJURIES IN ITALY - INAIL DATA [MEAN 2006 – 2009]

THE MINING ACCIDENT SEVERITY RATE OF FATAL INJURIES IS THE HIGHEST OF ALL INDUSTRIAL SECTORS
FREQUENCY RATE OF OCCUPATIONAL DISEASES FOR SECTORS IN ITALY - INAIL DATA [MEAN 2006 – 2009]

THE MINING FREQUENCY RATE OF OCCUPATIONAL DISEASES IS THE HIGHEST OF ALL INDUSTRIAL SECTORS
**WHY A PREVENTION THROUGH DESIGN APPROACH (PtD)??**

60% OF THE FATAL INJURIES AT MINING AND CONSTRUCTION SITES ARE GENERATED BY WRONG DECISIONS DURING THE PLANNING PHASE!

**Errors causing fatal injuries, and costs vs time**

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**Potential errors Compromising S&H conditions**

- **50%**: Feasibility analysis / Preliminary Project
- **65%**: Evolution of Preliminary Project
- **70%**: Executive Project
- **10%**: Yard

- Lacking: ☑️ Hazard recognition; ☑️ Risk evaluation
- Design not coherent with a correct Risk Assessment
- Lacking Risk Management approach
- Lacking Risk Management
- ☑️ Conservation
- ☑️ Improvement

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“Mario Patrucco, Sicurezza ed Igiene del Lavoro, 2012”
THE PROBLEM IN THE ITALIAN SAFETY & HEALTH REGULATIONS: A “FUNNY” MISUNDERSTANDING...

The Italian regulation on the safety and health of workers at work D.Lgs. 81/2008, introduces the Risk Analysis as a mandatory task for the employer.

It must be strongly underlined that, even if in the Italian enforcement of the 92/104 EEC “daughter” Directive (D.Lgs 624/96) is not included in the aforementioned Safety and Health Document, the Safety and Health problems should be carefully considered from the very first phases of the activity design and must be set in force at the beginning of the exploitation activities, in coherence with the statements of art.6 (and in the corresponding National enforcement) of the afore mentioned 89/391 EEC “mother” Directive.

This is a substantial difference from the 92/57 EEC Directive (and from the corresponding National enforcement) on the implementation of minimum safety and health requirements at temporary or mobile construction sites where along the design phases the PSC document (Safety and Health Plan) has to be drawn up with the safety analysis and followed by a final document. Even though the DSS (Safety and Health Document) corresponds formally to the POS (Safety and Health Plan at execution stage), the resulting situation being potentially confounding for some “self proclaimed Risk Analyzers”
 package developed with Microsoft Visual Basic® 6.0 Professional: approach grants full compatibility with the Italian Public Administration existing data bases, so that information import and export are quite easy.

★ free compilation system of the computer technique the empty lines acting as a memo, so that they can be completed later.

★ A very interesting feature of the database is the updating through TCP/IP protocol: the main database resides on a main server, and users can add their own data to the archive.
**THE COMPUTER ASSISTED TECHNIQUE: THE FIRST STEP**

<table>
<thead>
<tr>
<th><strong>feasibility project</strong>, where one must assess structural risks, in order to avoid special local anomalies (topographical, geological, etc.) and features [asbestos, Radon and radioact, possible water comings, etc.]. From this kind of work comes out a defined project. It will include flexibility (less precise the input data are, more it must be flexible, e.g. in case of underground works, where data must be refined during the execution, for example by back analysis techniques);</th>
<th>![Image of a construction site]</th>
</tr>
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<tbody>
<tr>
<td><strong>previous activation of fundamental services and plants</strong>, and <strong>targeted training of the staff</strong>, to assure workers’ safety during their daily activity:</td>
<td></td>
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<tr>
<td><strong>detail analysis</strong> aiming at avoiding accidents and industrial diseases related to the specific kind of job, based on the identification of hazards</td>
<td></td>
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</tbody>
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THE COMPUTER ASSISTED TECHNIQUE: TESTING AREA

The testing area was the quarry system of Provincia di Torino

Quarries WITH / WITHOUT a numerical risk assessment

- 8
- 19
- 57

Si
No
NO DSS
# The Computer Assisted Technique: Data Input Features of the Main Input Screen

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Basic Info**                               | - Company references  
  - Company general organization  
  - Company local organization  
  - Local geology (in brief)  
  - Orebody extent, as evaluated on the basis of prospecting activities (brief report on the techniques, e.g. geostatistics, etc.)  
  - External conditions (geographic, environmental, climate, pedology, etc.) affecting the decisions  
  - Main and accessory ore typologies  
  - Mining technique, and selection criteria: do the decisions consider a risk analysis approach?  
  - Expected production rate  
  - Mining machinery characteristics, and selection criteria: do the decisions consider a risk analysis approach?  
  - Processing plant layout and characteristics: do the decisions consider a risk analysis approach?  
  - Waste disposal: occupied area and technical characteristics, preliminary phases, machinery and plants  
  - Expected energy consumptions kWh/y and installed power kW (total, mine, plant, other)  
  - Number of workers in mine, processing plant, total — work organization (shift duration, h/week, day/year)  
  - Efficiency parameters (mine, plant and total): tons/man hour, tons/kWh electric, tons/kWh diesel  
  - Mechanization level (mine, plant and total): kW/man  
  - Criticalities identified with reference to the environmental impact and work safety, and countermeasures  
| **Risk Analysis Special for Workers Safety and Health** | - Workers safety and health management Company policy (in a quality approach, if any)  
  - Approach to the management of the local safety and health problems (in a quality approach adopted?)  
| **Safety**                                    | - Health and safety work conditions check procedures (both for routine and occasional situations)  
  - Emergencies management organization  
  - Safety systems maintenance policy  
  - Workers safety information and training - updating  
  - Accident records and violations check and analysis  
  - Pollutants generation / emissions / emissions (initial and periodic check program)  
  - Waste disposal safety (stability, pollutant release, etc.)  

**Data Retrieval**

- Personal data  
- Environmental information  
- Exploitation technique  

**Customized Data Retrieval**

- Search  
- Detailed  
- Export in Excel  

**Safety**

- Family in planning  
- Safety in management solution  
- Supervision  

**Workers Safety**

- Check / conservation / improvement  
- Environmental impact  

**Select**

- Generate  
- Detailed  
- Export in Excel  

**Data Standards**
THE COMPUTER ASSISTED TECHNIQUE: DATA OUTPUT

FEATURES OF THE MAIN INPUT SCREEN

| Single extractive site | - report (all the stored data) of the last recorded situation
<table>
<thead>
<tr>
<th></th>
<th>- time history of the main recorded data (a list of main site data is updated at every access)</th>
</tr>
</thead>
</table>
| Pre-organized retrieval possibilities | - mine company
|                        | - mine location (district)
|                        | - mining rights and duration
|                        | - sub-contractors (if any)
|                        | - ore, main and accessory
|                        | - mining technique(s)
|                        | - processing plant characteristics
|                        | - waste disposal characteristics
|                        | - emissions / immisions: criticalities (if any) and control measures |

Extractive sites companion

| Custom retrievals | - mine company
|                  | - mine location (detail)
|                  | - mining technique(s) details
|                  | - processing plant characteristics details
|                  | - waste disposal characteristics details
|                  | - efficiency parameters (mine exploration, plant and total):
|                  |  - tons/man hour, tons/kW electric, tons/kW diesel
|                  | - mechanization level (mine, plant and total): kW/man
|                  | - emissions / immisions: measurement, measurement techniques and organization, recorded values, control measures detail |

Custom retrievals on safety topics

| Safety topics as approached at the design phase |
| Safety topics as approached at the checking phase |
| Safety measures (technical data) |
| Accident records (if any) |
| Pollutants at workplaces measurement results (technical data, and achieved results) |
!!USEFUL LINK!!

http://www.provincia.torino.it/ambiente/attivita_estrattiva/software_sicurezza
CONCLUSION

➢ The target of our work is to help Local Mining Inspectorates Offices and Risk Analyzers with pro-active and operative prevention actions to improve the safety and health conditions in mining.

➢ The computer assisted technique is user-friendly and compatible with other informatic tools.

➢ This approach should increase the assessment and management of quarry sites and to improve the efficiency.

**IT SHOULD SPREAD THE SAFETY CULTURE AS LIFE STYLE**

“Ai morti la ricchezza nulla giova”

*Eschilo*
Thank you for the kind attention