Methodology to build Key Performance Indicators (KPIs): for industrial or occupational safety?
How to build efficient KPIs?
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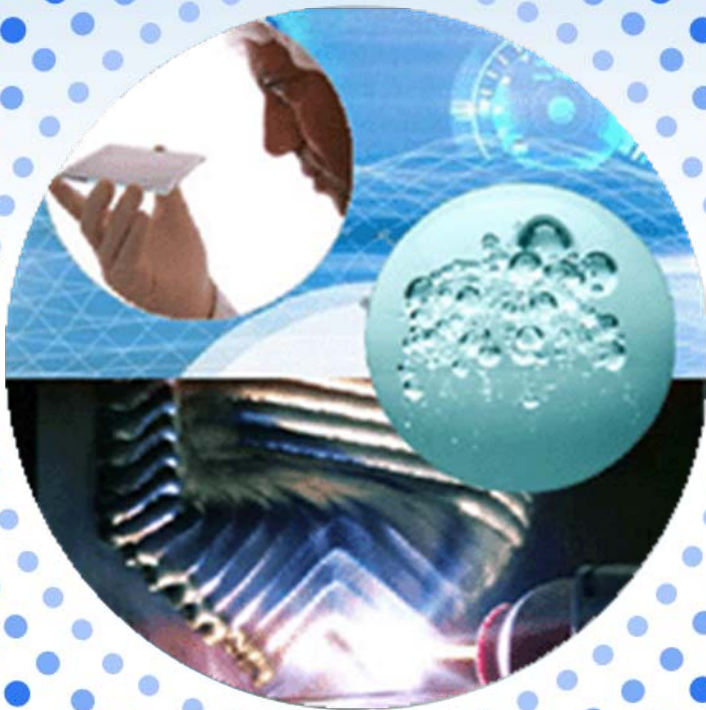# Table of contents

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KPIs: proposal for scope

⊙**K**ey
- Relevant clue

⊙**P**erformance
- Operation and/or ***Process safety*** and/or *Occupational safety*
- *Our point of view: (Process) safety and not (only) operation*

⊙**I**ndicator
- Making sense regarding SAFETY
- A set of indicators or One global indicator ???

Indicators for Safety or for Availability ?

◉ **Performance: set of properties defining system functioning but not its safety (**availability, efficiency, profitability, productivity, …**)**

KPIs : Safety or Performance ???

◉ **Indicators are different …**

  ○ **Easier to make an "availability" diagnosis rather than a safety "diagnosis"**

  ○ **The day before a major accident some "performance indicators" could be "green" (e.g. BP refinery at Texas City)**

◉ **… but could overlap**

  ○ **Organisational factors could have effects both on safety and performance**

Occupational Safety or/and Industrial Safety?

- The iNTeg-Risk project => performance indicators
- Occupational Safety [Hopkins 2000, Baker Panel 2007] => individual safety
  - Refers to individuals
  - Accidents such as falls, trips, crushing, electrocution, vehicle accidents…
- Industrial Safety => process safety
  - Refers to the process, the different types of hazards, the incidents linked to the process
  - With potential damages to the plant (including employees) and to the environment
  - And possible generation of multiple fatalities or diseases
- Presence of an effective **Personal** SMS does not ensure systematically an effective **Process** SMS
  - Managing one does not mean managing the other one: e.g. Texas City

Lagging and Leading Indicators

◉ **Reactive** monitoring: use of **lagging** indicators

- Failures in use ⇔ Operational feedback

◉ **Active** monitoring: use of **leading** indicators

- Measures of safety activity or failures revealed by safety activity ⇔ **NEW vision** for Operational feedback

	Lead	Lag
Personal SMS		BP Texas City, Exxon Longford
Process SMS	**Challenge for iNTEg Risk**	DC 10 Ermenonville

Dimensional of Indicator Space

State of art on indicators

- 2 complementary aims:

  - For appraisal, overview
    - ➜ picture of a function (technical, social, economical,…) = **DIAGNOSIS**
  - To allow forecast (sensible extrapolation)
    - ➜ trend, evolution   = **PROGNOSIS**

  ⇨ Use in numerous fields of activities : health, criminality, economics, social satisfaction, road security…

- Lessons to be learned:

  - Global indicators   ➜ large samples
  - Specific indicators   ➜ small samples
  - Indicators must be built according to an 'ad hoc' method in order to fulfill a precise goal
  - Indicators are not « **self understandable** »
  - They **need to be analyzed, interpreted**

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Lessons learned in the nuclear field

⇨ **An additional fundamental aim : to detect damages to safety and to in depth defense as soon as possible**

○ **A shared knowledge data base for global indicators (AIEA, NRC, …): Reactor Automatic Shutdowns; Number of Safety related Events; Fortuitous Unavailability Rate; Outages; Radiation protection (Dosimetry); …**

Moreover : indicators could be related to

○ **A specific issue (e.g. life cycle management)**

○ **A Risk informed approach**

○ **The Organizational context**

What about the past experiences in indicators?

- ⊙ **A trend to multiply indicators**

- ⊙ **Interpretation difficulties**

- ⊙ **Necessity to know the 'models' leading to safety degradation (causality data)**

- ⊙ **Lessons do not seem to be learned from the past (towards use of indicators)**

  - ○ **Back and forth behavior**

  - ⊙ *However, indicators are very useful, or even, mandatory*

Efficient features for indicators (T,H,O) (1/3)

Example from Nichols and Marcus (University of Minnesota,1990) : « It is important to prevent accidents and radioactive release: So, it is intended that **indicators forecasting potential problems should be developed before they occur.** »

◉ **Theoretical and methodological questions complement one another**
- **Data collection**
- **Treatment**
- **Analysis**

Knowing that:
- **The number of indicators increases => impact on data collection, treatment and analysis**
- **Uncertainties => uncertainty, bias or mistake on the conclusions**

◉ **Necessity to be objective**

Efficient features for indicators (T,H,O) (2/3)

⦿ Scientific features
- Mandatory
  - Validity (measure of the defined criterion)
  - Accuracy, reliability (reproducibility)
  - Robustness (stability in relation to inopportune or untimely changes)
- Trade-off dimension
  - Simple in use
  - Transparency
  - Cost-effectiveness
  - Sensibility (ability to detect **small** changes)
  - Relevant balance between specific and generic
    - Two pitfalls to avoid:
      - To focus on indicator in forgetting the "real life"
      - To take account of the overall situation in forgetting specific changes "here and now"

◉ Practical Features

- ○ Simplicity and easiness of implementation and use

- ○ Convenience for drafting results

- ○ Allowing a reliable, sound and with no bias interpretation

Scientific and Practical features give implicit ways for building indicators

Reference to AEIA conclusions

◉ **Necessity for a set of indicators …**

◉ **… that can not be used solely.**

◉ **Importance to reach an equilibrium between leading and lagging indicators**

◉ **Importance of the engineer judgment and calculation tools**

◉ **Assessment using quantitative indicators AND periodic qualitative analysis**

◉ **Opinions and approaches lead in the different countries are significantly different ➜ Need for harmonization**

◉ **Need for indicators according to the public, the citizen**

◉ **Need to ensure that these indicators are transparent and understandable AND not submitted to manipulations**

Conclusion: Advantages and drawbacks of indicators

Built using the previously defined features…

Indicators are:

- ◉ Way to make objective intuitions and observations

- ◉ Possibility to provide organizations with early warnings

- ◉ But « The map is not the field ». The indicator is only a tool.

- ◉ Though indicators seem to be useful, not to say essential as they give a global and "expurgated" picture of the situation

- ◉ One can always wonder if certain risks and malfunctioning could not be detected through this indicators mechanism

- ◉ Have to be completed with others tools: safety audit, organisational analysis…

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