# An innovative method for the measurement of operational performance of occupational safety and health management systems

## 1. Why should we measure and monitor performance of OSH management systems?

Occupational safety and health management systems (OSH MSs), which are based on international (e.g. ILO-OSH 2001, OHSAS 18001) or national specifications, are implemented and maintained in thousands of enterprises all over the world. The mentioned documents have been elaborated with the assumption that numerous enterprises will implement OSH MSs, thus they will significantly contribute to the reduction of occupational accidents and diseases and related economic costs. However, there is no sound evidence so far that the systems in question are sufficiently effective in terms of preventing occurrence of accidents and diseases at work.

A search for new methods geared towards improvement of the functioning of OSH MSs is currently the priority. It is particularly noticeable in the context of the further development and worldwide promotion of OSH MSs. With regard to this search, the most promising directions to follow include exploration and application of performance management methods and making use of novel approaches to safety focused on ensuring system resilience. The latter, in particular, which resorts to the selected leading performance indicators, allows for an early detection and prediction of faults and deficiencies in the functioning of OSH MSs.

## 2. What does the measurement of management system operational performance consist in and why is it different from the system audits?

Basically, three main approaches to the measurement of OSH MS performance may be distinguished: 1) result-based approach, 2) compliance-based approach, and 3) process-based approach[1]. In the first one the so-called **lagging indicators** (also referred to as *outcome* or *negative* indicators) are applied, whereas, for the two remaining approaches, **leading indicators** (also referred to as *pro-active or positive* indicators) are applied. **Leading indicators,** being applied to the evaluation of system compliance with a given specification, form a group of **structural performance indicators**, while those applied for the evaluation of effectiveness of internal system processes are referred to as **operational performance indicators**.

The **lagging safety indicators** usually are based on the following data: the frequency of accidents at work and occupational diseases, accident- or sickness-related absence from work, the number of near misses, etc.. However, the usefulness of their application for the evaluation of OSH MS performance is challenged by numerous experts. The said indicators are based on data that are both historical and delayed in time in relation to the occurrence of reasons affecting the values being measured. In practice, such a state of affairs renders an appropriately rapid response and the introduction of corrective or preventive actions impossible.

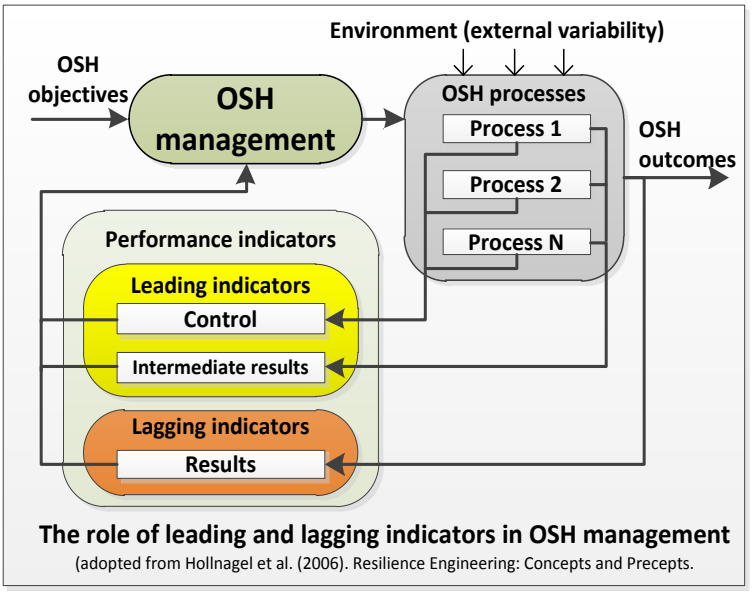
In the case of **leading indicators** their changes take place in advance of those in lagging indicators, and thus allow an earlier intervention in case of either possible non-compliances in the

[1] Cambonet. al., 2005. ***Towards a new tool for measuring Safety Management Systems Performance***. The 2nd Resilience Engineering Symposium, 8-10.11.2006, Antibes-Juan-les-Pins, France.

management system or weak points, disturbances or the absence of expected results in the sphere of operational performance, even before negative consequences of that situation, namely accidents at work or harmful exposures of employees, occur.

As regards **structural performance indicators**, their application is not fundamentally different from the classic methods of auditing OSH MSs. This is due to the fact that **structural performance indicators** are of qualitative nature, and their application comes down *de facto* to either checking as to whether individual components of the system are properly designed or evaluating the extent to which system procedures are implemented and being followed.

In turn, **operational performance indicators** provide information on the status of individual processes within the management system. As such, when tracked over time, such indicators provide information on progress of change within the management system and assist in forecasting future status and planning. Examples of such indicators include: the number of work stations at which risk assessment has been carried out or updated; the percentage of employees trained in OSH in a given period; the percentage of safety checks on machines and installations, as compared to the plan, etc. Monitoring values of such indicators makes it possible to understand how a given system operates at the shop-floor level in contrast to the results of structural performance measurement (i.e. auditing), which tend to only indicate what the system consists of.



The role of leading and lagging indicators in OSH management
(adopted from Hollnagel et al. (2006). Resilience Engineering: Concepts and Precepts.

## 3. Why we should strive to apply a minimum number of performance indicators?

A review of the previous attempts at measuring OSH management performance shows that the measuring tools are usually characterised by a relatively large number of performance indicators (up to several hundreds). Practical application of such complex measurement systems could be difficult since it would entail a significant amount of time, the need to carry out training for staff allocated to perform measurements, and a large volume of information to be collected and processed. Furthermore, with regard to a large number of indicators, many of them may be interdependent since they may possibly be based on the same data, or be linked in cause and effect relationships. Therefore, there is a need for reducing the number of performance indicators down to several or a dozen or so major KPIs.The number of those KPIs, however, would need to be sufficient for proper evaluation of OSH MS operational status. A small number of KPIs will allow managers to better focus their attention on the most important issues, and to initiate suitable corrective or preventive actions in due time.

## 4. What is the concept of “resilience” and how can measurement of KPIs improve resilience of OSH management systems?

The proposed approach to OSH MS performance measurement is in line with the recent concepts and methods of **resilience engineering**. The **resilience** is defined as “the intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it

can sustain required operations under both expected and unexpected conditions"[2]. The systems designed according to this concept should demonstrate the following basic abilities:1) **learning** (knowing what has happened), 2) **responding** (knowing what to do), 3) **monitoring** (knowing what to look for), and 4) **anticipating** (finding out and knowing what to expect). Implementing the method of performance measurement into the OSH MS contributes directly to the third system ability, i.e. to **monitoring,** because carefully selected operational KPIs should provide early warning signals on any irregularities or faults within the functioning of OSH MS. Furthermore, the KPIs should be selected in such a way as to ensure that the other three basic abilities of the **resilient** system are achieved.

## 5. What are the advantages of measuring the operational effectiveness of OSH MS by means of KPIs?

1. Obtaining the tool for complex evaluation of OSH MS in the company;
2. The opportunity to significantly increase effectiveness of OSH management by:
   - approaching OSH MS from a different perspective, i.e. not only through final outcomes of monitoring processes but also through their in-progress results; paying attention to the diversity of available indicators and understanding the usefulness of information behind;
   - early response to emerging issues concerning operations of OSH MS processes;
   - implementation (if applicable) of new processes capable of measuring real concern about safety issues among different groups of workers or on particular management levels;
3. Selection and presentation of a company's most essential safety data and by doing so, enhancing communication between senior management and safety staff as far as the company's safety performance is concerned;
4. Support to top management in a decision-making process by delivering necessary data in the form of Key Performance Indicators;
5. Ability to easily adjust existing OSH MS to the requirements of future ISO 45001 standard.

## 6. What is the goal of KPI-OSH Tool project and why was it undertaken?

The international project KPI-OSH Tool (***Development and validation of KPI-based method and user-friendly software tool for resilience-focused measurement of OSH management system performance***) was launched in order to improve the overall effectiveness of OSH MSs, in terms of their real capacity to prevent occupational accidents and diseases. The project aims at elaboration of a method for selecting most important KPIs tailored to the needs of enterprises and development of an easy-to-use tool to support monitoring of OSH MS performance.

## 7. What is the idea of the KPI-OSH Tool project?

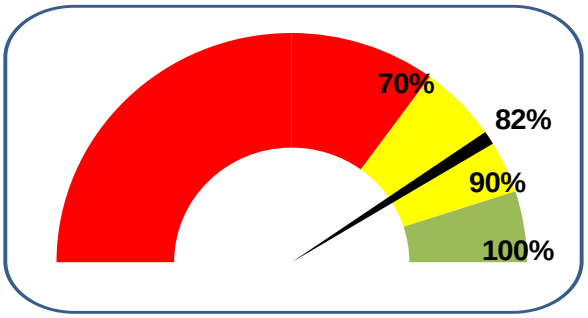
The KPI-OSH Tool project will be carried out for 26 months, between May 2014 and June 2016. At the first stage of the project, it is planned to develop an initial set of pro-active performance indicators. Existing OSH literature, legal documents and consultations with enterprises maintaining OSH management systems will serve as a reference point for this exercise. Next, the selected indicators will be assigned to particular OSH MS components in accordance with the draft of ISO 45001 standard. In a subsequent phase, on the basis of the defined criteria, Key Performance

[2] Hollnagel E., 2013. ***Prologue: The Scope of Resilience Engineering***. Resilience Engineering in Practice. A Guidebook. Ashgate Publishing Limited, UK.

Indicators will be selected out of component sets. It is assumed that the criteria will be based on the set of SMART rules (Specific, Measurable, Achievable, Relevant, Time-bound) completed by appropriate resilience criteria. Finally, ranks for the criteria will be determined. A selection of KPIs will be supported by the Analytic Hierarchy Process (AHP), which is one of the most commonly used multi-criteria decision-making method.

The next step will consist in verification of the actual usefulness of the suggested selection method and chosen KPIs with regard to their ability to measure and monitor OSH MS. Pilot tests will be conducted in several companies in Poland and Finland.

In order to support tests a dedicated software tool will be developed. It is expected that the tool will help to gather data necessary to calculate indicators and to present them in the way that makes it easy for users to visualise and comprehend the information at a glance, i.e. to display the data in a form of a dashboard.




As regards dissemination activities, it is planned to elaborate and distribute brochures presenting project's activities and findings, organise seminars for interested parties and to publish articles in scientific journals. Project outcomes will also be published on a project website www.oshkpitool.eu.

## 8. What is the role of companies participating in the KPI-OSH Tool Project?

The participation of companies' representatives in the project is a necessary condition to achieve useful and practical results tailored to their business needs. An initial set of PPIs and a set of KPIs will be consulted with safety staff and top management safety representatives invited to take part in the project. Afterwards, project team members in cooperation with companies' representatives will identify OSH MS procedures relating to particular KPIs. They will also determine means of using the software tool to collect and present KPIs values. The tool will be installed on local PCs thus ensuring full control and protection of all collected and transformed data. Furthermore, companies' representatives involved in the project will receive appropriate instructions and training as far as the use of the tool is concerned.

Pilot implementation and tests of the tool will continue for approx. 10 months. During this time researchers involved in the project will pay a number of visits to the companies in order to consult the tool users and solve possible problems. To find out how helpful the method turned out to be, a survey will be conducted among companies' managers. Collected remarks will help to improve the method, verify a KPI set and upgrade the prepared software tool.

## 9. Who is involved in KPI-OSH Tool project?

The project is carried out by the following consortium made up of three partner organisations:

- CIOP-PIB (Central Institute for Labour Protection - National Research Institute, Poland): Daniel Podgórski (the project coordinator), Anna Skład, Zofia Pawłowska, Małgorzata Pęciłło;
- FIOH (Finnish Institute of Occupational Health): Jarmo Vorme and Riikka Ruotsala, and
- TECNALIA Research & Development (Spain): Jesús Lopez De Ipiña Peña and Julien Negre.

In order to orientate the project towards the latest trends in OSH management and resilience engineering, the project is supported by the Scientific Advisory Panel (SAP). SAP is composed of

four internationally recognised scientists and specialists, namely: prof. Erik Hollnagel (University of Southern Denmark), prof. Markku Alltonen (FIOH), and prof. Gerard I.J.M. Zweetsloot (TNO, the Netherlands), and a representative of OSH MS certification bodies - Mr. Mario Calderon, Deputy to CEO in AENOR, Spain.

The project is the outcome of the call for proposals published in 2013 by SAF€RA. SAF€RA (Coordination of European Research on Industrial Safety towards Smart and Sustainable Growth) is an FP7 ERA-NET project carried out by an international consortium of 20 institutions. The objective of SAF€RA is to coordinate European research programmes in the field of industrial safety as well as to raise awareness on the importance of research in this area as a crucial factor for dynamic knowledge-based economy.

## 10. Contact information

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