Call topics

2016 SAF€RA joint call

T1: Big data and intelligent prognostics for life extension of aging facilities

T2: Developing professional competencies and learning from experience

February 2016

SAF€RA is a partnership between 19 research funding organizations from 10 European countries who collaborate on research programming and launch joint calls in the field of industrial safety. It prolongs the work developed in the SAF€RA ERA-NET, which was funded by the European Union's Seventh Framework Programme for research, technological development and demonstration.

SAF€RA was an ERA-NET initiated by ETPIS, the European Technology Platform on Industrial Safety, which coordinated research investment among a number of EU Member States in the field of industrial safety. After the end of the support by the European Commission in 2015, 19 organizations decided to continue to invest jointly in research and have founded the SAF€RA partnership.

During the ERA-NET phase, two joint calls for proposals were launched, covering the following topics:

- 2013: Human and organizational factors including the value of industrial safety
- 2014: Innovating in safety and safe innovations

A third joint call, launched in 2016, addresses two topics:

- T1: *Big data and intelligent prognostics for life extension of aging facilities*
- T2: *Developing professional competencies and learning from experience*

These topics are described below.

Please note that the research questions listed for each topic are not intended to be exhaustive. Research proposals may address other related research questions, if they are included within the scope of the topic. The funding available for each topic is not related to the length of its description in this document.

The questions addressed by this call are relatively broad, and will often benefit from inputs from several scientific disciplines. Multidisciplinary or inter-disciplinary proposals are encouraged. It is anticipated that the following disciplines can provide useful contributions to the call: engineering and the natural sciences, management science, organization studies, psychology. Proposals including other disciplines are welcomed.

Research proposals which adopt a comparative approach (analyzing similarities and differences between different European countries, between different industry sectors, between large and small organizations, *etc.*) are encouraged.

More information:

- on SAF€RA: http://www.safera.industrialsafety-tp.org/
- on previous calls: http://call.safera.eu/

Scope of the call

The scope of the call includes research on the management of industrial risk, avoiding major impacts on the environment or society. The scope also includes research on products and systems required to improve safety in industrial settings.

Industries involved include, among others, the process industries, energy, dangerous goods transport, construction and operation of major infrastructure and the services industry.

The scope includes occupational safety as long as there is a relation with major accident hazards in industrial settings. For example, if research primarily with an occupational safety perspective aims to prevent an accident sequence which could also lead to off-site consequences, then it is included in the scope.

T1: Big data and intelligent prognostics for life extension of aging facilities

Context. A number of industrial facilities and infrastructures in different high-hazard sectors including energy, the process industries and offshore oil and gas will soon reach, or have already exceeded, their initial design lifetime. The safe life extension of these aging facilities is an important problem for their operators and for regulators. One component of this problem is inspection techniques and relevant indicators to detect fatigue and corrosion in materials before mechanical integrity is compromised.

The EC funded SafeLife-X project "Safe Life Extension management of aged infrastructures networks and industrial plants" has addressed the topic of aging and life extension management and has brought valuable inputs for research on this topic. See www.safelife.eu-vri.eu and in particular the section "Public Results".

One promising source of progress towards this problem comes from "intelligent prognostics", or techniques for data collection and analysis that can detect symptoms of aging and the associated hazards. They include machine-to-machine "smart sensor" technology, data fusion techniques and "big data" trending analysis and predictive diagnosis techniques.

Research questions. The following questions are relevant to the call:

- What are the advantages and drawbacks of different aging and asset management approaches (ISO 55002, ISO 19900, API RP 581, IAEA Safety Guide No NS-G-2.12, etc.) for different industry sectors?
- What theoretical models of aging (e.g. probabilistic, deterministic, precision) should underlie the use of smart sensors & big data?
- What new applications and combinations of existing smart sensor technologies can improve the early identification of risks to equipment?
- Can new approaches to data fusion, trend analysis and predictive diagnosis improve the control of aging risks?
- Can specific benefits arise from the real-time detection of changes in operating conditions and the identification of correlations between measurements?
- How should the new prognostics methods be linked to maintenance procedures?
- Which performance indicators should be used by operating companies to ensure that aging risks are managed in a satisfactory manner?
- How should regulators assess the use of these new technologies and analysis methods, and what requirements should they impose on operating companies?

Research types. Projects should aim for innovative concept development and pilot tests or for progress beyond the current state of science and technology. The call mainly aims to fund projects which investigate new applications or innovative combinations of existing technologies, or novel data fusion and data analysis techniques.

T2: Developing professional competencies and learning from experience

Context. Companies with high-hazard activities spend significant amounts of money and time on professional training activities, but the return on this investment, in terms of knowledge, skills and craftsmanship, is often lower than hoped for. Researchers suggest that traditional approaches to professional training, which are often based on the presentation of relatively theoretical knowledge in classroom-type settings, have little impact on situated work activities, and thus on the safety of operations. Some researchers go so far as to analyze professional training as a *justification activity*, which responds more to external pressure (from regulators, from the media and the general public) to show that "we are making efforts to improve skills and ensure safe operations" than to the real needs of sharp-end workers involved in hazardous activities.

Researchers who adopt a socio-cultural or socio-constructivist view of learning, analyzing the role of discussions and social interactions on the creation of collective norms, highlight the significant learning role played by non-classroom activities, including apprenticeship and mentoring programmes, organized discussions between members of a community of practice or a trade, discussions within a work group, role-playing and storytelling activities. The use of simulation exercises, serious games and simulator-based training is promoted by specialists in vocational education.

Safety researchers also point to the importance of integrating lessons learned from experience feedback into professional training programs and formal work procedures as a manner of ensuring that procedures do not deviate from the reality of work situations. Likewise, the discussion of recent incidents and near misses within a community of practice is a key mechanism for maintaining awareness of risks and understanding of the system's behavior in abnormal operating conditions.

Research questions. The following questions are relevant to the call:

- What is the **relative effectiveness** of the methods referred above for developing professional competencies and skills, in particular concerning their safety impact? What relevant metrics can be proposed?
- What key factors can i**mprove the effectiveness** of these methods for developing professional knowledge and competencies?
- Which **new mechanisms** and procedures for learning in industrial safety, including serious games, simulator-based techniques, e-learning platforms, debriefings, storytelling and "enriched learning from experience" can be proposed? What are the strengths and weaknesses of different approaches in developing knowledge, skills and competencies?
- Do managers appreciate the importance of debate within a work group or community of practice for the development of knowledge and skills, and hence for safety? How can this bottom-up "invisible work" be made more visible and better integrated with the top-down dimensions of safety management?
- Can new types of training, based on discussion concerning situated work activities, the risks of specific tasks and the possible conflicts between safety procedures and work situations, be proposed and tested?
- Is there potential to learn more from success (and not only from failures) and to share this learning within work groups and communities of practice?

Research types: The call aims to fund applied research and development projects, rather than theory development.

The following types of research are expected for topic 2:

- **case studies** which analyze existing practices and highlight their key features and obstacles to their application elsewhere;
- development and evaluation of **new approaches** to develop professional skills and competencies;
- exploratory studies (appreciative inquiries).

Given the nature of research questions concerning safety, multi-disciplinary projects are particularly encouraged.