

**Strategy of ensuring comprehensive
man-made safety and security of
hazardous production facilities
of techno-infrastructure
(current status and ways forward)**

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Initiators and developers of the project

EMERCOM of Russia (head coordinator, developer and performer)

- **Federal Space Agency**
- **Gazprom Public Company**
- **Russian Academy of Sciences**
- **Ministry of Education and Science**
- **State Committee of Science (Republic of Armenia)**

Starting points of the Project

- There are only 2 types of emergencies, these are local and system emergencies.
- **Local emergency** is incidental to disturbances in the elements of the technical system.
- **System emergency (disaster)** is incidental to disturbances in the system structure (normal interaction of its components).
- Physical mechanisms and scenarios of emergencies and disasters have principal differences.
- Comprehensive safety is immunity of a technical system to disaster progression.

Distinctive features of disaster progression

- 1. Disasters are only possible in complex technical systems**
- 2. The potential for catastrophic outcome is a hallmark of complex systems. (R. Cook). The reason is presence of critical modes in the system.**
- 3. You cannot eliminate the potential hazard in a system, but only avoid danger.**
- 4. Disasters develop in both long and short life systems.**
- 5. Emergencies, as a rule, do not pre-empt disasters.**
- 6. Emergency protection does not keep you safe from disasters.**
- 7. Safeness is a feature of the system as a whole, not of its elements.**
- 8. So far, there is no practically valuable symptomatology of disasters.**
- 9. Steady-state operation modes of the system fail to represent information about disaster progression.**
- 10. According to the statistics, disaster risks rise steeply after the system has released from repair (especially overhaul) and after a change of the operating staff.**

Status of safety against manmade hazards

- As far back as 35 years ago, the world has been plagued by most consequence-costly manmade disasters.
- Multiple attempts to provide protection against disasters proved unsuccessful. **MacSea.**
- The existing national and worldwide standards of protection against disasters are inoperable.
- Manmade disasters are nearly uncontrollable
- Solving the issue of protection against disasters is considered crucial.
- According an UN forecast, for the first time in hystory, the global gross product growth will stop by this mid-century.

Kashira GRES-4. Asymptomatic catastrophe 2002 (10 days past the overhaul)

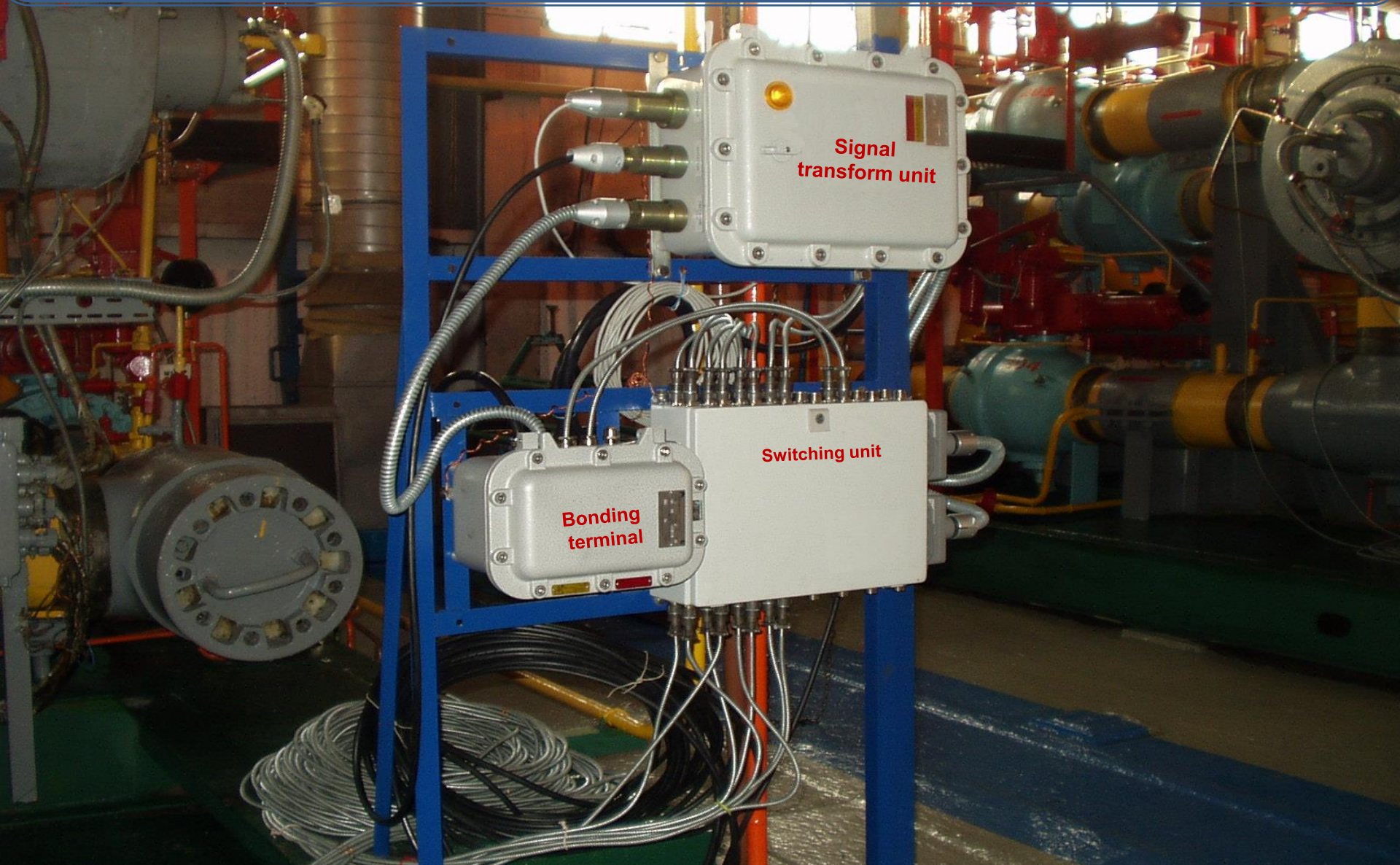


Scientifically and experimentally justified undertakings of the Project

- Carried out a complex of multiyear targeted R&D works at space rocket engine construction facilities and gas fields of Gazprom PC and OJSC Severneftegazprom.
- Demonstrated the existence of a generic scenario of manmade disasters.
- Identified experimentally worked-out and feasible symptomatology of disaster progression for the early detection and prevention.
- Created a pilot system of integrated manmade safety and security at gas fields (shown at the ISSE 2015) on request of Gazprom Dobycha Yamburg.
- Early detected and prevented field manmade disaster development at an actual gas field.
- Formed an interagency structure of general initiators, developers and testers of the Project.
- At the initiative of Gazprom PC, jointly developed Program for the Single System of Integrated Manmade Safety and Security at Fields of the Oil-and-Gas Complex in the Russian Federation (to be published in January 2016).

A pilot disaster protection system

Explosion-proof, stationary design. Areal distributed, group synchronized, information flow centralized system



Existing structures dealing with manmade safety

1. Santa Fe Institute (USA, 1984).
2. German Association for Complex Systems and Nonlinear Dynamics (Deutsche Gesellschaft fuer Komplexe Systeme und Nichtlineare Dynamik, Germany, 1996).
3. CRED (Belgium).

PS: there is no concept and organizing structure that solve practical problems of manmade safety

Proposal on organizing works related to manmade safety and security in the BRICS Countries

Establish a Joint Institute of Safety and Security of Techno-Infrastructure of the BRICS Countries.

Functions of the institute:

coordinating works and solving practical problems of ensuring safety and security of hazardous production facilities on the