Standardization as a tool for prevention of oil spills in the Arctic: Summary Report, and Full Report

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Emergency Prevention, Preparedness and Response (EPPR)

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Purpose

The purpose of this Summary Report is to provide a synopsis of the project “Standardization as a Tool for Prevention of Oil Spills in the Arctic” – an effort undertaken by the Arctic Council Emergency Prevention, Preparedness, and Response Working Group (EPPR). In essence, the detailed document serves as a tutorial on the practice of engineering and technical standards development worldwide. It describes how standards for both the oil and gas, and maritime industries are identified, developed, established, maintained, and, most importantly, utilized by both industry and regulators to manage and mitigate risks to people and the environment. Through this effort, the EPPR hopes to increase the understanding of the processes and organizations involved in standardization work and facilitate a deeper appreciation of why standards are such a critical element in oil pollution prevention.

This Summary Report also provides a series of observations intended to help frame a way forward for the Arctic Council in ensuring that measures listed in the Task Force on Pollution Prevention (TFOPP) Framework Plan for Cooperation on Prevention of Oil Pollution from Petroleum and Maritime Activities in the Marine Areas of the Arctic (Framework Plan) are followed up and executed in order to protect the fragile Arctic environment, its people, and its resources.

1. Background

One outcome of the 2013 Arctic Council Ministerial meeting in Kiruna, Sweden, was the establishment of the TFOPP. The group was tasked with identifying how the Arctic Council could best contribute to marine oil pollution prevention. What resulted was creation of the Framework Plan whose objective was, among other things, “…to strengthen cooperation, including exchange of information, among the Participants in the field of prevention of marine oil pollution in order to protect the Arctic marine environment.” Through formal adoption of the Framework Plan the countries agreed in principle to the following recommendations:

- “Cooperate to develop an overview of the existing and potential technical and operational safety measures specifically designed to prevent oil pollution in the Arctic marine environment from offshore petroleum activity.”
- “Promote the development of standards and/or best practices relevant to the prevention of oil pollution in the Arctic.”
- “Assess whether existing and proposed standards for petroleum activity are sufficient to meet Arctic challenges.”
- “Support participation of technical experts in the efforts referred to in the above two bullet points.”
- “Promote cooperation between competent authorities on issues concerning the prevention of Arctic marine oil pollution from petroleum activities.”

To support action on the recommendations, EPPR proposed a project that would improve the understanding of engineering and technical standards and, in the process, promote the development and adoption of standards and/or best practices relevant to the Arctic. The project “Standardization as a Tool for Prevention of Oil Spills in the Arctic” was approved by
2. **Scope**

Types of activities covered by this study encompassed those conducted by both the offshore petroleum and maritime industries. Petroleum activities (oil and gas) included exploration; drilling and production; subsea and topside installations; internal and external transportation pipelines; and offshore storage and offloading facilities. Maritime activities included all kinds of shipping including cruise traffic, fisheries in international waters, national and international transportation of products, transportation of crude oil and petroleum products, and petroleum service vessels.

The primary focus on the topic of standards was in describing how a new standard is developed and who participates in the process, when and how they are updated, which organizations and industries work to maintain and adopt the standards, and how regulators use standards. The report does not address monitoring of industry adherence and compliance with standards applicable to their type of operation. Given a focus on prevention of oil spill, discussion of standards for oil spill preparedness and response was not included in the report.

3. **Methodology**

The work of identifying, compiling, and synthesizing data on standards organizations, industry groups, and existing standards, and then writing a comprehensive report was undertaken by Proactima AS, a Norwegian firm contracted by the Norwegian Coastal Administration (NCA). The work was funded by the Norwegian Ministry of Foreign Affairs. After the contractor completed preliminary work on a literature search, a preliminary report was drafted through guidance from Norway and the U.S., who served as project co-leads. This was forwarded to EPPR Heads of Delegation (HODs) for further distribution and review by state and federal government entities, non-government organizations, and industry organizations. During the course of the project co-leads convened a series of conference calls to review, discuss, and adjudicate all comments received from internal and external sources. After finalization of the detailed report, it was forwarded to HODs for final country approval in advance of submittal to SAOs.

4. **The Arctic**

The Arctic is described in the Arctic Monitoring and Assessment Programme (AMAP) Assessment Report: Arctic Pollution Issues from 1998. The vast region of the Arctic extends across northern North America, northern Europe and northern Asia, taking in eight countries and the expanses of sea and ocean in between. The terrestrial, freshwater and marine environments throughout this area exhibit considerable variation in climate, meteorology, and physical geography.

The Arctic is often delimited by the Arctic Circle (66°32’N), which approximates the southern boundary of the midnight sun. Such a definition, however, is simplistic, given variations in
temperature, presence of mountain ranges, distribution of large bodies of water, and differences in permafrost occurrence. It should be noted, however, that there are many different definitions of the Arctic.

On the basis of temperature, the Arctic is defined as the area north of the 10°C July isotherm, i.e., north of the region which has a mean July temperature of 10°C. This isotherm encloses the Arctic Ocean, Greenland, Svalbard, most of Iceland and the northern coasts and islands of Russia, Canada and Alaska. In the Atlantic Ocean west of Norway, the heat transport of the North Atlantic Current (Gulf Stream extension) deflects this isotherm northward so that only the northernmost parts of Scandinavia are included. Cold water and air from the Arctic Ocean Basin in turn push the 10°C isotherm southward in the region of North America and northeast Asia, taking in northeastern Labrador, northern Quebec, Hudson Bay, central Kamchatka, and much of the Bering Sea. Another geographical indicator of the Arctic region that is partially determined by climate is the presence of permafrost.

5. Engineering, Technical, and Operations Standards

a. What is a Standard?

The American Society of Mechanical Engineers defines a standard as “... a set of technical definitions and guidelines, “how to” instructions for designers, manufacturers, and users.” The International Organization for Standardization (ISO) suggests that “A standard is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose.”

Definitions of what a standard is may vary, but the intent and desired outcomes are similar. Standards, by design, are based on the consolidated results of ever advancing science and technology, and encompass an industry’s collective experience and lessons learned on what works and what doesn’t. Through the acknowledgement and sharing of individual failures and their remedies, the probability of the occurrence of similar incidents is reduced, if not eliminated.

b. Why are Standards Needed?

The purpose of a standard is to provide a baseline set of principles and practices for industries to follow in the production of goods and services. It represents a form of universal acceptance of an agreed upon level of quality and reliability, and is a basis for comparison between companies and solutions. Such an approach leads to more generic solutions which are cost and time efficient for the industry, while at the same time helping the regulatory community.

Standards, in particular safety standards, may contribute to the prevention of accidents and oil spills and are an important part of risk management. Standards typically represent an industries level of current good / best practice, and in that sense also include a level of risk / performance. Combining the supporting use of risk assessment and the use of standards promotes acceptable performance levels.
c. **Who develops standards?**

The participation in standardization work is normally voluntary and the result usually based on consensus. Standards are developed by professional societies, industry organizations, manufacturing associations, and other national, regional, and international entities and organizations, in response to the needs of their members and stakeholders in any given field.

For example, the ISO is a large developer of voluntary international standards dealing with a variety of industry from food safety to technology. ISO standards are developed by technical committees.

IOGP is the international oil and gas producers association. They contribute to the petroleum industry’s standard development including Arctic standards. IOGP prepare operating guidelines and recommended practices for both onshore and offshore Arctic operations. IOGP strongly promotes the development and use of international standards.

For shipping, IMO (International Maritime Organization) develops, maintains and coordinates standardization activities. They develop Conventions and Protocols, Codes, Guidelines and Recommendations. Conventions are mandatory for IMO member countries when ratified. The conventions represent laws and regulations for international shipping.

If a sufficient number of national standard organizations agree, an international standard development project is established and a working committee with experts on the area is appointed. Usually each nation’s standards organization will organize the nation’s committee members and assure harmonization of opinions to take care of the nation’s interests. Members of
the technical committee can be representatives from industry (associations), research institutes, certification bodies, government, non-governmental organization, and other stakeholders.

When a committee draft standard has been prepared, this is sent for hearing to relevant authorities, organizations and industry groups / associations. This hearing is normally public.

The strengths with the standards is that through the process, stakeholders with knowledge and experience within the area covered by the standards can bring in their knowledge and experience.

Below is an illustration on the process used by the petroleum industry to develop standards.

![Standardization process in the petroleum industry](image)

The development of IMO codes or other instruments within IMO is based on the following process:

![Standardization process in the Maritime industry](image)
d. **How do regulators use standards?**

**Petroleum Industry**

Regulators of the oil and gas exploration, development, and production industry do not generally develop engineering and technical standards. In many cases, however, they do leverage the expertise of standards organizations and incorporate externally developed standards by reference in the regulations or as guidance. Consensus-based standards play an important role in the regulator’s technical definition of the safety level of oil and gas installations they regulate. The oil and gas industry and regulators need broad support and application of the standards to work effectively.

Norwegian regulations rely on standards to expand on and define functional requirements. The Guidelines to the HSE regulations provide recommended norms for fulfilling the specific requirements. These usually take the form of recognized industry standards such as ISO, API and NORSOK standards. When a recommended standard is applied, the requirement in the regulation can be considered to be met.

**Shipping**

In principle IMO Conventions and Codes provide the foundation. The Flag State or the Port State base their regulations on IMO codes and conventions and the International Association of Classification Societies (IACS) class definitions as a minimum. The classification societies implement this into their Class Rules in general and for Arctic in particular.

Maritime Authorities are an active part in the development of international rules and regulations at sea, and they have to ensure that these rules and regulations are implemented into national law.

e. **Standards for Petroleum Exploration and Development**

The development of standards within ISO/TC 67/SC 8 Arctic Operations is an example of relevant work for offshore operations in the Arctic. The process started with recommendations from the Norwegian – Russian Barents 2020 project. As a result of this a new international standardization subcommittee ISO/TC 67/SC 8 Arctic Operations was established in 2012. The scope of the ISO/TC 67/SC 8 is standardization of operations associated with exploration, production and processing of hydrocarbons in onshore and offshore Arctic regions, and other locations characterized by low ambient temperatures and the presence of ice, snow and/or permafrost. Requirements for offshore pipelines and offshore structures are excluded from ISO/TC 67/SC 8 as they are included under ISO/TC 67/SC2 and ISO/TC 67/SC7, respectively.

A total of six working groups have been established under SC 8 developing a new set of standards for Arctic operations. The ISO/TC 67/SC 8 Arctic offshore operations standard structure is shown below.
Table ISO/TC 67/SC 8 Arctic offshore operations

<table>
<thead>
<tr>
<th>Working group</th>
<th>standard ID</th>
<th>Title</th>
<th>Chair</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO/TC 67/SC 8 WG1</td>
<td>ISO 35101</td>
<td>Working environment</td>
<td>Norway</td>
</tr>
<tr>
<td>ISO/TC 67/SC 8 WG2</td>
<td>ISO 35102</td>
<td>Escape, evacuation and rescue from offshore installations</td>
<td>Russia</td>
</tr>
<tr>
<td>ISO/TC 67/SC 8 WG3</td>
<td>ISO 35103</td>
<td>Environmental monitoring</td>
<td>Russia</td>
</tr>
<tr>
<td>ISO/TC 67/SC 8 WG4</td>
<td>ISO 35104</td>
<td>Ice management</td>
<td>Canada</td>
</tr>
<tr>
<td>ISO/TC 67/SC 8 WG5</td>
<td>ISO 35105</td>
<td>Material requirements for Arctic operations</td>
<td>Norway</td>
</tr>
<tr>
<td>ISO/TC 67/SC 8 WG6</td>
<td>ISO 35106</td>
<td>Arctic metocean, ice and seabed data</td>
<td>Norway</td>
</tr>
</tbody>
</table>

f. Standards for Vessels
IMO can develop Conventions, Codes or other instruments. IMO conventions are mandatory and binding for IMO member countries when they have been accepted and ratified by individual governments. Codes contain regulations with recommendations, which can be made binding by the flag state. For Arctic shipping, the development of the Polar Code was an important step to strengthen maritime safety in the Arctic.

Figure: Standardization hierarchy in the Maritime industry
6. International Organizations

6.1 Organizations that develop standards related to the petroleum industry

ISO is one of the organizations that develops standards. Examples of standards that are affecting the Arctic are the ISO 19906:2010 - Arctic offshore structures.

Other important organizations that are involved in the developments of standards and guidelines are the IOGP (The International Association of Oil & Gas Producers). IOGP have developed several reports about standards. One example is the IOGP report 440 (IOGP 2014) they describes the value of standards and present an overview of ISO standards used in the Oil and Gas Industry.

The American Petroleum Institute (API) represents United States’ Oil and Natural Gas Industry. They develop and maintain petroleum industry standards and guidelines. API sells their standards globally and API experts also participate in international standardization work within ISO and other organizations. The petroleum industry has widely adopted API standards in their management systems. A wide range of API standards are directly or indirectly relevant for the prevention of oil spills, although few are directed solely toward prevention of oil spills or to the Arctic. Only one Arctic related standard (API RP 2N) was identified. In addition the API Specification 4F:2013 and the API RP 2MET/ISO 19901-1:2005 recommended practices are relevant for design and operations in cold regions.

The NORSOK standards were developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness for petroleum industry developments and operations. NORSOK standards are as far as possible intended to replace oil company specifications and serve as references in the authorities’ regulations. None of the NORSOK standards are developed for Arctic operations specifically. However, NORSOK standards are applicable generically for safe petroleum installation design and activities in all areas.

6.2 International Maritime Organization - developing international requirements (via Codes and Conventions) addressing international shipping

IMO is the United Nations International Maritime Organization for maritime issues with the main mission to promote safe, secure and efficient shipping on clean oceans. Conventions and Protocols, Codes, Guidelines and Recommendations are developed through the IMO. Conventions are mandatory for IMO member countries when ratified. The Conventions represent laws and regulations for international shipping. Codes and Recommendations are not binding for countries. They may be made binding by the member State by incorporation in the national legislation. Codes may be made mandatory by including appropriate references in a Convention.

The Polar Code developed by the IMO, forms the central document for prevention of oils spills in the Arctic from maritime activities. The Polar Code is mandatory thru amendments to both the Safety of Life at Sea Convention (SOLAS) and the International Convention for the Prevention of Pollution from Ships (MARPOL).
The Code covers the full range of design, construction, equipment, operation, training, search and rescue and environmental protection matters relevant to ships operating in the inhospitable waters surrounding the two poles. It includes mandatory measures covering safety and pollution prevention and recommended provisions for both.


The International Association of Classification Societies (IACS) has published unified requirements for polar ships that apply to ships constructed of steel and are intended for navigation in ice-infested polar waters, except ice breakers. These were adopted by IACS Council in 2006 and are part of all member society Rules since 2008. Under continuing development to extend scope and address issues of interpretation and application. For further information, see: [http://www.iacs.org.uk/document/public/Publications/Unified_requirements/PDF/UR_1_pdf]

Classification societies can also develop standards and guidelines for Arctic maritime and petroleum activities. Some of these classification societies are e.g. American Bureau of Shipping (ABS, [www.eagle.org](http://www.eagle.org)), Bureau Veritas ([www.bureauveritas.com](http://www.bureauveritas.com)), DNV GL ([www.dnvgl.com](http://www.dnvgl.com)) and Lloyds Register [www.lr.org](http://www.lr.org)

7. **National Standards Organizations**

On the national level, there are both national and international standards organizations which are very much linked to the industry. API, which is described above, is an example of an organization that represents the United States’ Oil and Natural Gas Industry. The classification organizations are working nationally, but they have also a role internationally.

The national standardization institutions contribute to the work of regional and international standardization organizations. As an example, Danish Standard contributes to the European standardization organization (CEN) and chose to implement most of the standards from these organizations in Denmark.

Another example is Standards Norway which is the Norwegian standardization organization. They represent Norway in CEN and ISO. Standardization in Norway is a private activity initiated by the private sector associations and is performed in close contact with the public sector due to tight coupling between regulations and standards.

The final example is the Russian GOST R that is the Federal Executive Body, implementing inter-industry coordination and functional regulating in the fields of standardization, metrology and conformity assessment. GOST R holds the function of National standards Body in the Russian Federation and represents Russia in international (and regional) organizations for standardization.
8. **Industry Perspective**

Some of the brightest minds in the world dedicate significant amounts of their time to the development of engineering and technical standards. Companies encourage and pay for this participation, and for good reason. Accidents and oil spills are bad for employees, bad for the environment, bad for stock holders, and bad for public relations.

Firms thus take seriously their charge of harnessing their collective energy to help create standards that incorporate the latest knowledge to prevent unsafe operations or ones that might negatively impact the environment. Industries as a whole support an all-inclusive approach to standards development, and even encourage regulators’ participation in the complex, lengthy standards process. Through this synergy, they see the benefit that can arise from having approved standards adopted by reference in regulations.

The scores of standards applicable to the oil and gas, and maritime sectors, is credible evidence that they place a high priority on their development. They have argued, however, that a focus on Arctic-specific standards ignores the universal application of many existing standards to the Arctic environment.

9. **Observations**

Existing standards organizations competently manage the development and maintenance of standards worldwide. The existence, however, of often competing organizations does create schisms within industries that can lead to different standards approaches for the same piece of equipment or practice. Regardless the source of standards, there are basic axioms that are built upon proven technology, best practices, and experience that frame the basis for a true understanding of incident and oil spill prevention.

- Standards can be useful – if they are implemented.
- Standards are **not** the only measure to prevent accidental spills.
- Standards alone are **not** sufficient to prevent oil pollution.
- Proper risk management is essential.
- The number of “Arctic-specific” standards is relatively limited.
- Existing generic non-Arctic-specific standards are equally relevant to operations in the Arctic and can also contribute to prevention of incidents.

Engineering and technical standards, whether Arctic focused or not, take considerable time and energy to develop, and to implement. But their benefits are immeasurable. By constantly learning from failures, near misses, and emerging technologies, organizations can work to improve standards to help their industry as a whole to perform more safely and efficiently. By understanding systems and operations, whether in the oil and gas sector or the maritime
industry, regulators and operators alike can help prevent incidents that can lead to oil spills and significant harm to people and the environment. Collectively taken, standards help everyone.

10. Way Forward

Domestic and international work on engineering and technical standards development is ongoing, with or without the knowledge, input, or support of government entities. Yet these standards play a significant role worldwide in determining how risk is managed and mitigated. By dedicating personnel to work on or closely monitor the work of standards committees, the Arctic States can help influence the direction and scope of standards to include concerns that might otherwise be overlooked by the industry. Also, by adopting common standards by reference in regulations, countries can also help drive a consistent application of the latest in engineering and technical knowledge. Through an Arctic Council approach to circumpolar consistency in best available engineering design and operational excellence through standards, the proper balance can be structured in a way that protects the Arctic’s pristine environment while allowing industry to pursue emerging economic development opportunities.