



Technical Specification

ISO/TS 20790

Oil and gas industries including lower carbon energy — Guidelines for green manufacturing and lower carbon emission of oil and gas-field equipment and materials

Industries du pétrole et du gaz, y compris les énergies à faible teneur en carbone — Lignes directrices pour une production verte et une réduction des émissions de carbone des équipements et matériaux des champs pétroliers et gaziers

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 67, *Oil and gas industries including lower carbon energy*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

To meet the 2030 Sustainable Development Goals (SDGs), ISO/TC 67, representing the global oil and gas industries including lower carbon energy, plays an important role in reducing use of materials and other resources, increasing the recycling of resources, and reducing waste and emissions, e.g. greenhouse gas (GHG) emissions, while continuing to deliver the energy and products demanded by their consumers. The industry is committed to enhancing sustainability and to overcoming the world's most pressing sustainability challenges. The industry is aiming to take a more proactive role on both climate and health, safety and environment (HSE) performance issues.

There are opportunities throughout the oil and gas supply chain to increase positive impacts towards the SDGs. No matter how the energy transforms and how the industry develops, equipment, materials and other infrastructure serve as the foundation and the cornerstone for the development of the industry. Advanced materials, equipment and structures are the premises; they facilitate improvements in the efficiency of exploration and production, the safe and reliable operation of transportation and the continuous optimization of refining for oil and gas industries including lower carbon energy.

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Oil and gas industries including lower carbon energy — Guidelines for green manufacturing and lower carbon emission of oil and gas-field equipment and materials

1 Scope

This document provides guidelines for green manufacturing and lower carbon emission practices of oil and gas-field equipment and materials used in the hydrocarbon industries.

The guidelines include the establishment of a green attribute system and implementation of sound practices for green manufacturing and lower carbon emission, such as green design, manufacturing, remanufacturing, evaluation and management.

This document is applicable to organizations involved in the design, construction, engineering, commissioning, operations, maintenance, decommissioning and reuse of materials, equipment, installations and process systems applied in the hydrocarbon industries.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org/>

3.1

sustainable development

development that meets the environmental, social and economic needs of the present without compromising the ability of future generations to meet their own needs

[SOURCE: ISO Guide 82:2019,^[1] 3.2, modified – Note 1 to entry has been removed.]

3.2

green economy

economy or economic development model based on the principles of *sustainable development* (3.1) and a recognition of the interdependence and coevolution of human economies and natural ecosystems over time and space

[SOURCE: ISO 6707-3:2022,^[2] 3.9.32]

3.3

full life cycle

expected period of time in which the product is expected to function according to manufacturer's specifications

[SOURCE: ISO 17078-1:2004,^[3] 3.17, modified — The wording has been adjusted according to the ISO/IEC Directives, Part 2.]

3.4

green manufacturing

manufacturing model in line with the concept of *sustainable development* (3.1) and *green economy* (3.2), the goal of which is to make the product consume fewer resources, have less negative impact on ecological environment, and finally realize the continuous coordination and optimization of economic and social benefits of organizations in the product *full life cycle* (3.3)

3.5

lower carbon emission

reduced carbon emissions compared to previous practices, by the implementation of *green manufacturing* (3.4) or the assistance in developing lower carbon energies

3.6

green design

design and development activities where the performance, quality, development cycle and cost factors are optimized so as to meet the goal of *green manufacturing* (3.4)

3.7

green processing

advanced technologies or practices adopted in the process of product manufacturing with the aim of reasonable utilization of resources, cost saving and environmental pollution reduction

3.8

remanufacturing

process of upgrading the equipment and materials so that the quality characteristics are not lower than that of the prototype new product

3.9

remanufacturing rate

percentage of the sum of the value of the remanufactured component to the value of the entire device or product

3.10

reutilization

process of using disused equipment and materials that are also of value for other purposes, either directly or after treatment

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reutilization rate

mass fraction of the reutilized part to the total amount of scrap equipment and materials

3.12

recycling

process of treating previously used equipment and materials so that they can be reused as raw materials

3.13

recycling rate

mass fraction of the recycled part to the total amount of scrap equipment and materials

3.14

green attribute

characteristic of reducing materials and energy and reducing the ecological environmental impacts in the product *full life cycle* (3.3)

3.15

green assessment

evaluation and judgment of whether the *green attribute* (3.14) of the product meets the requirements of a standard or agreement

3.16

green supply chain

supply chain system that integrates *green manufacturing* (3.4) practices into its entire process, including the logistics process after product disuse

4 General

Green manufacturing and lower carbon emission are two important topics which should be considered together for the sustainable development of equipment and materials.

NOTE 1 Green manufacturing in the oil, gas and lower carbon energy areas supports the guidance for addressing climate change and sustainability concerns in ISO Guide 64,^[4] ISO Guide 82^[1] and ISO Guide 84^[5].

NOTE 2 Green manufacturing and lower carbon emission are related to the full life cycle of the equipment and materials. For a specific organization, they can only be involved in some areas of the design, construction, engineering, commissioning, operations, maintenance, decommissioning and reuse, etc.

Green manufacturing is the main method to realize lower carbon emission in equipment and materials, including the following aspects:

- in the traditional hydrocarbon industries, by adopting green design, green manufacturing and recycling, etc., to reduce the consumption of resources and energy, increase the utilization efficiency of resources and energy, and reduce the adverse effects of carbon emissions; and
- in the evolving lower carbon energy industries, by improving the performance of equipment and materials or by the research and development of new equipment and materials, to meet the needs of the development and utilization of new energy.

Low carbon emission is the main evaluation index of the green manufacturing effect of equipment and materials. From a macro perspective, the main ways to achieve carbon neutrality include carbon replacement, carbon emission reduction, carbon storage and carbon cycle.

For hydrocarbon equipment and materials, the specific measures that can contribute to green and lower carbon development are shown in [Table 1](#).

Table 1 — Main carbon reduction measures for hydrocarbon equipment and materials during the carbon neutralization process

Main ways for carbon neutrality	Measures	Specific measures for oil field equipment and materials
Carbon replacement	Wind, solar, electricity, geothermal, hydrogen, ammonia and biomass energy replace traditional fossil energy, etc.	Using lower carbon energy, or Updating or developing new equipment and materials to meet the development and utilization of lower carbon energy.
Carbon emission reduction	Save energy and improve energy efficiency, etc.	Energy saving, material saving, efficiency improvement and emission reduction
Carbon storage	Carbon capture, utilization and storage (CCUS), carbon capture and storage (CCS), etc.	Updating or developing new equipment and materials to meet the need of carbon storage.
Carbon cycle	Artificial carbon conversion, forest carbon sink, etc.	Developing new equipment and materials

The key for conducting sound practices for green manufacturing and lower carbon emission in the field of oil and gas-field equipment and materials are:

- to identify the green attributes and establish the green attribute system;
- to fully consider these attributes and take actions in the process of product full life cycle, including design, manufacturing, resource and energy cyclic utilization, etc.;
- to implement the evaluation and management of green attributes, and continuously improve them.

The overall approach is shown in [Figure 1](#).

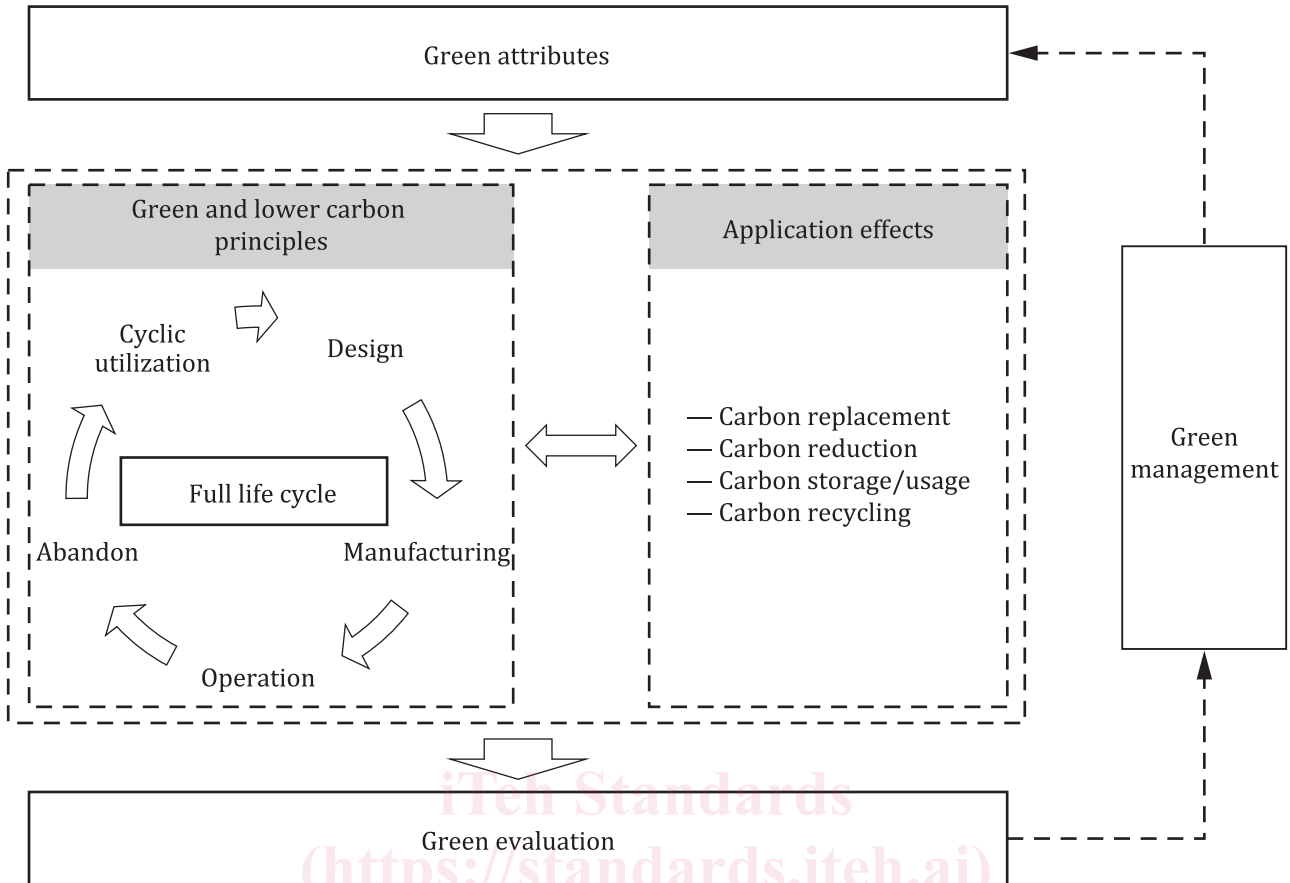


Figure 1 — Overall approach for green manufacturing and lower carbon emission

5 Green attributes

5.1 Principles for determination

5.1.1 General purpose

Green attributes should meet the needs of green design, manufacturing, remanufacturing, green evaluation and green management.

5.1.2 Operational and measurable

Green attributes should be measurable and comparable, easy to quantify, and have clear measurement indicators and referable standard requirements.

5.1.3 Systematic and specific

Green attributes should be specified and systematized based on the intrinsic value of the green manufacturing of the equipment and materials to clarify the content, measurement indicator and judgment basis of the green attributes.