

DEP SPECIFICATION

**SELECTION OF CHEMICALS TO TREAT UPSTREAM
PROCESSES AND FOR CONSTRUCTION AND
TREATMENT OF WELLS**

DEP 20.01.10.10-Gen.

February 2019

DESIGN AND ENGINEERING PRACTICE

DEM1



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the selection of chemicals or fluids used in drilling and production operations. The scope of chemical selection addressed by this DEP is:

- Chemical function
- Chemical secondary effects
- Chemical application
- HSSE aspects, including Product Stewardship

The DEP requirements and recommendations are intended to provide a technical framework for chemical selection based on existing standards, guidelines and requirements specified in this DEP.

The primary purpose of this DEP is to ensure chemical function is achieved and, where necessary, chemical secondary effects are mitigated.

This DEP provides references to standards, guidelines and procedures for chemical selection produced by standards organisations and professional discipline organisations, and DEPs that have requirements relevant to chemical selection. Generic guidance for chemical selection is also provided for types of chemicals that lack selection and qualification standards and guidelines.

For the purpose of this DEP, a chemical is considered to be any product that is supplied with a Safety Data Sheet (SDS). However, the scope of this DEP is focused on chemicals that are used for drilling and production operations, where the purpose is treating produced and injected fluids, specifying and treating utility systems, preparation of fluids used for drilling and well completion, preparation of fluids for well cementing, and remediation of production facilities. There are many other types of chemical used during construction, maintenance and operation of production facilities, such as lubricants, degreasers and cleaners, coatings and paints, abrasives, hydraulic and control fluids, heat transfer fluids, process preservation chemicals, chemical tracers, dye penetrants, electrical insulation gels, adhesives, installation and commissioning chemicals that are not in the scope of in this DEP. However, many aspects of the technical framework presented in this DEP are relevant to the selection of these chemicals and may be applied where there is an absence of a standard or guideline, or supplement existing standards and guidelines.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual (DEM) 1 – Application of Technical Standards.

This is a revision of the DEP of the same number dated February 2017; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorisation to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in wells and facilities related to oil and gas production. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be

acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Availability	Percentage of time that the chemical is at the required concentration, or within the required concentration range, in the fluid that is being treated when required for production operations.
By-product	An incidental or secondary product made in the manufacture or synthesis of a chemical.
Chemical	A product supplied with an SDS, and in the context of this DEP, a chemical can be a commodity chemical (e.g., methanol), a specialty chemical that could have been formulated using proprietary knowledge (e.g., a corrosion inhibitor), a chemical recovered from produced fluids and reused for production operations (e.g., ethylene glycol), or a separated process stream that is used to treat produced fluids or process materials (e.g., water, hydrocarbon condensate).
Chemical function	The effect that a chemical is intended to achieve, where a chemical can have more than one intended effect and therefore has more than one function, e.g., a chemical can act as a corrosion inhibitor and as a biocide, a dissolved salt can act as weighting agent and a hydrate inhibitor.
Chemical operating envelope	A range of conditions where the required chemical function is required, or can be achieved.
Chemical secondary effects	Effects other than the chemical function attributable to the applied chemical, or degradation or reaction products of the chemical.

Term	Definition
Chemical selection	The selection of a chemical for an application based on some or all of the following: chemical or physical test methods, chemical or physical simulation, compliance with a standard or guideline for chemical selection, analogue application experience, industry “best practice” and in all cases, HSSE criteria.
Combination products	Chemicals that have multiple chemical functions.
Dosage Basis	The basis on which a chemical is applied to achieve the required dosage (concentration) in the fluid to be treated e.g., volumetric rate relative to oil rate (e.g., ppm v/v), weight relative to volume (e.g., lbm/bbl), mass flow rate of water (kg/kg).
Formation damage	The impairment to reservoir (reduced production or injection) in the vicinity of the wellbore (skin) due to permeability reduction caused by fluids used during drilling/completion and workover operations, or production operations that cause, for example, fines migration, wettability change, deposition of solids, clay swelling, emulsion block.
Hazard	The potential for chemical to cause harm, which is a fixed (constant) property of the chemical.
Hazard Statements	Phrase assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard.
Method of application	Method by which a chemical is applied that could be, but not limited to, batch application, <i>in-situ</i> generation (chemical reaction or electrolytic), reaction vessel, recirculation and regeneration/re-use, or direct injection consistent with DEP 31.01.10.10-Gen., into a process system, via a gas lift system, or via a subsea system.
Precautionary statements	Phrases (and/or pictograms) that describe recommended measures to be taken to minimise or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product.
Product	A commercial product consisting of chemicals supplied with an SDS.
Product Stewardship	The responsible and ethical management of the health, safety and environmental impacts of chemical (products and components) over their lifecycle and the reputational aspects associated with selection of hazardous chemicals.
Responsible Engineer or Scientist	In the context of this DEP, the engineer or scientist accepted by the Principal as competent in the field of chemical selection.
Risk	A function of the hazard and exposure that is not constant and can be managed and reduced.
Safety critical element	An item of equipment or structure whose failure could lead to the release of a Major Hazard or whose purpose is to prevent or limit the consequences of a major incident, excluding business loss.

Term	Definition
Stability	Stability of the chemical including thermal stability, degradation due to microbiological processes, mechanical stability associated with degree of shear, contamination stability where a trace contaminant can react with the chemical, phase stability where component parts of a chemical or recipe/formulation can separate into separate phases, and reactive stability where a chemical can react with another chemical or material.

1.3.3 Abbreviations

Term	Definition
AFFF	Aqueous Film Forming Foam
DCAF	Discipline Controls and Assurance Framework
DSC	Differential Scanning Calorimetry
EAC	Differential Scanning Calorimetry
ESD	Environmentally Assisted Cracking
HAZID	Hazard Identification Study
HIPPS	High Integrity Pressure Protection System
HLPS	Hot Liquid Process Simulator
LAWS	Low aromatic white spirit
lb/bbl	pounds per barrel (Alternate Form: lbm/bbl, ppb)
PPE	Personal Protective Equipment
PEFS	Process Engineering Flow Scheme (equivalent to P&IDs)
ppmv	parts per million by volume
P&ID	Process and instrumentation diagram (equivalent to PEFS)
QA/QC	Quality Assurance / Quality Control
SCE	Safety Critical Element
SSSV	Sub Surface Safety Valve
SDS	Safety Data Sheet (formerly MSDS)
SME	Subject Matter Expert
TGA	Thermogravimetric Analysis

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (8).