

Recommended practice: Simultaneous operations

Working Together for Safety Recommendation 045E/2021



SfS
Samarbeid for Sikkerhet

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Table of contents

1. Introduction	3
2. Purpose	3
3. Target group.....	3
4. Roles and responsibilities	4
5. Recommended practice.....	4
5.1 General requirements.....	4
5.2 SIMOPS planning.....	5
6. References and links.....	7
Appendix 1 Matrix.....	8
Appendix 2: Overview of keywords	10
Appendix 3: Examples of well-related SIMOP situations.....	12

1. Introduction

Simultaneous operations (SIMOPS) are generally all activities that are carried out on/at an offshore installation, and which may affect barrier functions and/or the risk level of other activities that are performed at the same time.

In order to manage increased risks and any impact on barriers, the companies must establish good routines in order to assess which simultaneous operations can be performed at the same time, and whether any measures must be implemented (SIMOPS analysis).

Since there are significant differences in the various installations, it is not appropriate to have a common matrix showing which activities may be carried out simultaneously. In this recommendation, we therefore focus on the planning process prior to SIMOPS.

2. Purpose

The purpose of this recommendation is to describe a planning process which ensures that simultaneous operations can be carried out in a safe manner, without a failure in one operation having consequences for other operations, causing the overall risk to become significantly higher than if the operations were performed alone. The process shall also ensure the optimal utilisation of surface and subsea assets.

In addition, for many people the term SIMOPS is linked to simultaneous drilling and production activities, so a separate chapter of this recommendation has been dedicated to this subject. This also contains a matrix that shows which drilling and well operations may be performed simultaneously with production.

3. Target group

The target group for this recommendation is everyone who plans/organises, leads or participates in simultaneous operations.

4. Roles and responsibilities

The overall responsibility for simultaneous operations lies with the Offshore Installation Manager (OIM). Those who plan activities are responsible for assessing whether these activities come under the definition of 'simultaneous operations'.

The production manager or equivalent holds the overall responsibility for ensuring that simultaneous operations are considered in the planning of activities.

The area responsible and manager for the SIMOPS activities (see main categories below) jointly hold the operational responsibility, which includes risk management and the coordination of activities for the specific area.

- Operations and maintenance manager
- Logistics manager
- Drilling and well manager
- Maritime manager

5. Recommended practice

This recommendation outlines a general process that should be followed for all simultaneous operations. The most common SIMOPS activities are drilling and well operations that are carried out at the same time as production. A "standard SIMOPS" matrix (Appendix 1) has therefore been appended to this recommendation.

The attached matrix assumes that production is in process, and examines which drilling (activity no. 2) and well (activity no. 3) activities may be performed simultaneously.

The matrix has three colour codes:

Red – activities that cannot be carried out simultaneously

Yellow – activities that must be assessed through a SIMOPS process

Green – routine SIMOPS where the activities are described in procedures and do not require a full SIMOPS review in each individual instance.

Each individual company must verify that the attached matrix is applicable, or adapt it to the individual installation if necessary.

5.1 General requirements

Simultaneous activities will comprise both small individual activities (routine SIMOPS) and large complicated activities. The different complexities will require different treatment with regard to the assessment of risk associated with the performance of activities simultaneously. A SIMOPS analysis is a structured review of the simultaneous activities, and an assessment of the hazards that may arise and influence each other or other activities. Such an analysis should be completed at a

multidisciplinary meeting with a facilitator, and documented through a dedicated report/meeting minutes.

The initiation and execution of simultaneous operations must only occur when identified risks have been described and managed. Each individual activity must have two independent barriers, so that failure of a single barrier cannot result in an undesirable incident.

The following activities/operations are examples of (but not limited to) activities/operations which, in combination with production/injection, are regarded as simultaneous activities:

- Drilling and well activities (including operations from floating and jack-up platforms/rigs)
- Maintenance activities (campaigns, work stoppages)
- Project and modification activities
- Critical activities/operations
- Critical lifting operations
- Critical well conditions
- Disconnection of critical parts of SAS system
- Diving, use of ROVs, anchor management and other maritime activities

For critical lifting operations, in addition to the requirements in NORSOK R-003 and the Norwegian Oil and Gas Association's Guidelines 088 AT and 090 SJA, the following is recommended:

- In the event of lifting above active wells, these shall be shut in and pressure relieved via DHSV
- The shutting down of adjacent wells shall also be considered
- Production lines in the area shall be shut down and the pressure relieved
- The gas lift system shall be handled in the same way as wells and production lines

Double retention/double independent barriers on the lifting arrangement in accordance with internal guidelines may be used as an alternative to shutdown.

5.2 SIMOPS planning

The method for completing SIMOPS reviews can be summarised in four steps:

- 1) **Preparations:** The person who calls the first meeting shall ensure the necessary preparations are carried out in advance of the SIMOPS meeting. This includes the following:
 - Assess prerequisites for the work
 - Collect data, drawings, previous experience and any available risk assessments for the relevant work
 - Do a preliminary breakdown of the job into sub-tasks and the required order

- Define the group participants who will take part in SIMOPS. This should be limited to one participant per discipline wherever possible
- Invite participants to the SIMOPS meeting

- 2) **Preliminary meeting**: A meeting with relevant project/operations staff in order to determine the scope and composition of the SIMOPS group, and to divide the main operations into activities at a level appropriate to the matrix of permitted operations. The meeting will involve the involved disciplines in order to discuss and highlight all the activities that may potentially be performed simultaneously. A decision regarding the main activities to be included in the review will be made at this meeting. It is important that representatives from all affected departments participate in the first meeting.

At the preliminary meeting, a plan regarding who will do what prior to the next meeting shall be prepared.

Who will be responsible for the preparation of the SIMOPS report must also be defined. The SIMOPS report may contain a SIMOPS matrix, a risk matrix or another planning document that presents which activities may be carried out simultaneously and the risks involved.

- 3) **Risk review**: A risk review should be performed for every potential simultaneous activity. All risks shall be reviewed, hazards and compensatory measures identified, and recommendations given regarding under what conditions simultaneous activities may or may not take place. The review should also consider the effect of schedule changes.

The risk review shall be facilitated by an engineer with experience of simultaneous operations. Possible incidents and conditions that may lead to hazardous situations for personnel, the environment or financial assets shall be identified for each sub-task. The participants in the review shall be those who plan, follow-up and carry out the activities.

The risk review shall result in a risk assessment of the interfacing operations/activities using SIMOPS, summarised in a report/manual. Part of this report may be a matrix of permitted operations derived from the SIMOPS review and a matrix of action elements.

All actions shall be entered in the detailed activity plans for the work to be carried out, linked to the relevant conditional activity. Potential consequences of the hazards shall be assessed. If the hazards may result in unacceptable consequences, the probability of the incident occurring shall be assessed. When doing so, participants must use their experience and best judgement.

Appendix 1 provides a list of keywords that can be used in a SIMOPS review.

- 4) **Final report**: A final report that clarifies permitted operations and associated risk. Compensatory measures, requirements for Safe Job Analysis, suggestions

regarding how to administrate the work permit system and other relevant comments from the SIMOPS review shall also be included in the document.

6. References and links

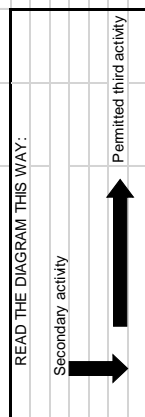
- 1) Regulations concerning the performance of work, use of work equipment and related technical requirements [FOR-2011-12-06-1357](#)
- 2) Regulations regarding organisation, management and employee participation [FOR-2011-12-06-1355](#)
- 3) IMCA Guidance on SIMOPS operations M-204

Appendix 1 Matrix

SECONDARY ACTIVITY IN A WELL AREA WHEN PRODUCING. Production is the primary activity.	ALLOWED THIRD ACTIVITY IN SAME WELL AREA														Hot work class A			
	Drilling activity				Intervention activity				XT maintenance									
	Conductor setting	Drilling (non safe cond.)*	Drilling* (secured)	Drilling Workover (safe* condition)	Coiled tubing or snubbing (secured)	Coiled tubing or snubbing (secured)*	Wireline (secured)	Wireline (secured)	Pump operation	Backflow operation through temporary lines	Injection into annulus	Christmas tree replacement	Maint above MMV Upper needle valve	Maint above MMV Lower needle valve or Plug/BPV in tgr hanger		Spindle on MMV or Bonnet on MMV or Rep. on prod. annulus or Lower needle valve or Plug/BPV in tgr hanger		
CONDUCTOR SETTING	N/A	N/A	N/A	N/A	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA
DRILLING RIG OPERATIONS																		
Drilling – non-safe condition	N/A	N/A	N/A	N/A	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	NO
Drilling – secured well	N/A	N/A	N/A	N/A	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA
Drilling/Well workover - safe condition	N/A	N/A	N/A	N/A	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA
COILED TUBING OR SNUBBING OPERATIONS																		
Secured state	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	NO
Secured state	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA
WIRELINER OPERATIONS																		
Secured state	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	NO
Secured state	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA
PUMP OPERATIONS																		
BACK FLOWING THROUGH TEMPORARY LINES																		
RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	NO
ANNULUS INJECTION																		
YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	RA
XT MAINTENANCE																		
Replacement Christmas tree	NO	RA	YES	YES	RA	YES	RA	YES	RA	YES	RA	YES	RA	YES	RA	YES	RA	RA
Repair valves above MMV	RA	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	RA
Repair uppermost CL/BL needle valve	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA	RA
Repair spindle on MMV																		
Repair bonnet on MMV																		
Repair Prod annulus valves																		
Repair bottom CL/BL needle valve																		
Install plug/BPV in tgr hanger																		
HOT WORK CL A	RA	NO	RA	RA	NO	RA	NO	RA	NO	RA	NO	RA	NO	RA	NO	RA	NO	N/A

* Definition of safe, non-safe, secured and not secured; see next page and attachment 3

Generally not allowed to perform as 3rd simultaneous activity. Dispensation according to company processes required.
A risk assessment is required to perform the 3rd simultaneous activity. Operation and risk to be approved according to company processes.
Activities that normally can be safely performed simultaneously



Explanation and comments on Appendix 1

Production is always the first activity and forms the basis for use of the matrix. The matrix is read by consulting the columns (downwards) to find activity number 2, which will be permitted simultaneously with production as long as sufficient barriers are in place in both operations.

When both production and a second activity are in progress, a third activity is assessed by reading horizontally from the ongoing second activity in the matrix. If this is OK/green, then this activity is permitted. If it is red, the activity is not permitted. If it is yellow, further risk assessments must be carried out in order to examine the overall risk of the operations.

Example (see also overview in Appendix 3):

Both production and drilling (non-safe condition) in progress. The matrix shows wireline operations (secured state) are permitted, but hot work class A is not permitted.

Safe condition:

This may be described a little differently by the individual operator, but the following generally applies:

- All technical well barriers are in place
- The well is mechanically isolated (e.g. with mechanical or cement plug) or drilling is in progress at a safe distance (min 2 x geological uncertainty) from the reservoir/zone with production potential

Non-safe condition:

Wells that are not in 'safe condition' are in 'non-safe condition'.

Secured:

A well is regarded as secured when one of the following measures is implemented:

- Well is cemented and cement tested
- Well is shut in or has heavy mud
- The drill bit has been pulled back to the last casing shoe and mud is being circulated and monitored
- Coiled tubing / snubbing unit has been pulled back to above the last perforation and drilling fluid is monitored/checked.
- Two well barriers are established/intact

All wells in 'safe condition' are regarded as being secured.

Appendix 2: Overview of keywords

Keywords that can be used in a SIMOPS review:

Keyword	Question
Planning and procedures	<ul style="list-style-type: none"> ➤ Do we have procedures for all the planned activities? ➤ Do we have a signed well program and updated section plans on board? ➤ Has it been decided which operation shall have the highest priority? ➤ Can governing documents be easily accessed by key personnel? ➤ Have we identified all critical phases for each operation, and have we decided whether any of these will take place simultaneously? ➤ Has a timeline been prepared? ➤ Have the operational limits that apply been clarified? (E.g. Hot work during downhole operations, other limitations in connection with simultaneous operations, limited access for maintenance, etc.)?
Equipment	<ul style="list-style-type: none"> ➤ Has all temporary equipment been checked and approved on land prior to dispatch? ➤ Has all temporary equipment been registered? ➤ Has all temporary equipment been installed without nonconformities offshore? ➤ Do we need additional equipment (e.g. sand separator, filter units, gas detectors, Chicksan and hoses, extra UHF radios, PPE etc.)?
Maintenance and modifications	<ul style="list-style-type: none"> ➤ Has planned maintenance been performed on safety-critical equipment, so this will not have to be taken out of service while the activities are in progress? ➤ Do we have an overview of planned maintenance in adjacent areas? ➤ What construction and modification projects will be in progress simultaneously?
Communication and Responsibility	<ul style="list-style-type: none"> ➤ Who has the overall responsibility? ➤ Who is responsible for each activity? ➤ Has everyone been informed of which radio channels shall be used? ➤ Have important telephone numbers been distributed?
Lifting operations	<ul style="list-style-type: none"> ➤ Are there any limitations with regard to the use of cranes? ➤ Is a lifting map for the cranes easily accessible? ➤ Are lifts planned above restricted areas? ➤ Have critical lifts that may impact upon other activities been planned? ➤ Do we know of any weather limitations for critical lifts, such as waves, wind force, wind direction, etc.? ➤ Must we shut in wells in connection with lifting operations? ➤ Are crew familiar with the lifting standard (Norsok R-003) and additional requirements? ➤ Is there a description of best practice for the lifting operation? ➤ Does the crew have knowledge of local procedures for cranes and lifting operations? ➤ Do we have devices for handling equipment heavier than 25 kg?
Logistics	<ul style="list-style-type: none"> ➤ Do we have prioritised shipping lists for the equipment for all the activities?

	<ul style="list-style-type: none"> ➤ Has heavy equipment been placed on the supply vessel in such a way that it will be easy to take it aboard the platform? ➤ Do we need a dedicated vessel in connection with shipping and/or the transportation of return cargo? ➤ Have we been allocated a sufficient number of beds for the duration of the simultaneous operations? ➤ Do we need extra personnel such as crane operators, flagmen, materialmen, production operators, fall rescue preparedness, etc.?
Barriers	<ul style="list-style-type: none"> ➤ Do we have two barriers in place for every well activity? ➤ Are any safety barriers not currently functioning? ➤ Are all administrative barriers and any compensatory measures in place? ➤ Knowledge of nonconformity status on the platform ➤ Do we have any safety systems out of operation?
ESD (Emergency Shut Down system)	<ul style="list-style-type: none"> ➤ Are all managers and foremen familiar with the ESD system on board? ➤ What temporary equipment shall be connected to the BESD (Blue Emergency Shutdown) system? ➤ What temporary equipment shall be connected to the platform ESD?
Safety and external environment	<ul style="list-style-type: none"> ➤ Do we need to establish and mark new escape routes/emergency exits? ➤ Is it necessary to establish alternative access routes? ➤ Are all relevant chemical datasheets easily accessible? ➤ Has the risk of discharge to the external environment been considered during the planning process? ➤ Have all preventive measures been implemented?
Working environment	<ul style="list-style-type: none"> ➤ In connection with the simultaneous operations, have conditions arisen that may have a negative impact on the working environment on board (e.g. with regard to noise, lighting, air quality, vibration, office space, 24-hour coverage, etc.?)
Nonconformities	<ul style="list-style-type: none"> ➤ Are we deviating from procedures and/or regulations? ➤ Have all nonconformities been approved and registered?
Quantitative Risk Analysis (QRA)	<ul style="list-style-type: none"> ➤ Are we deviating from assumptions in the QRA with regard to the staffing level, activity level, conditions and way in which the platform is operated?

Appendix 3: Examples of well-related SIMOP situations

The situations have been divided into three main categories, based on the phase of the operation in which they arise. The most serious incidents are described first in each category.

The criticality (red – High, yellow – Medium, green – Low) is set based on the loss/weakening of barriers (primary, secondary and tertiary) and actions that are required with regard to other simultaneous activities.

The situations are based on experience, as well as definitions in the risk matrix for well control incidents in accordance with NOROG guideline 135, 'Well control incidents'.

'All other activities shall cease' means:

- All activity that requires a work permit (both level 1 and 2) shall be stopped
- WPs are withdrawn
- Production is shut down

Some points use the term 'shall', while others say 'should'. In the cases where 'should' is used, it is up to the OIM to assess the situation's severity and determine what is required.

Drilling/Plug&Abandon		
1-H	SITUATION	Serious well kick – influx of formation fluid into the well, with pressure build up above the design criteria for the well and surface equipment with closed BOP, after positive flow check. Applies to both the reservoir and other formations with influx potential.
	ACTION	All other activities shall cease until the barrier is re-established. Production and gas lift above the relevant platform shall be shut down. Automatic pressure relief shall be considered.
	NOTES	Loss of primary barrier.
2-H	SITUATION	Loss of circulation. Loss of fluid barrier without the opportunity to maintain hydrostatic pressure in the well and closed BOP with pressure below. Applies to both the reservoir and other formations with influx potential.
	ACTION	All activities shall cease until the well can be kept full of drilling fluid. Production and gas lift above the relevant platform shall be shut down. Automatic pressure relief shall be considered.

	NOTES	Loss of primary barrier.
3-H	SITUATION	Leak in flange or riser below lowest barrier element in BOP. Formations that can flow are exposed. Applies to both the reservoir and other formations with influx potential.
	ACTION	All other activities shall cease. Pressure relief.
	NOTES	Loss of secondary barrier. The well must be secured immediately using a plug or equivalent.
4-H	SITUATION	Failure in BOP control. Unable to close any rams or annular valve. Formations that can flow are exposed. Applies to both the reservoir and other formations with influx potential.
	ACTION	All other simultaneous activities shall cease. Other activities may be resumed after the well has been secured, while the BOP is repaired.
	NOTES	Loss of secondary barrier. The well must be secured immediately using a plug or equivalent before the BOP is repaired.
5-M	SITUATION	Ordinary well kick – influx of formation fluid into well, with pressure build-up <u>within</u> the design criteria for the well and surface equipment with closed BOP, after positive flow check. Applies to both the reservoir and other formations with influx potential
	ACTION	Hot work in related areas shall be stopped. Assess compatibility with other activities. Consider stopping well service operations until the situation is clarified.
	NOTES	Loss of primary barrier.
6-M	SITUATION	Unintentional flow from well due to underbalanced situations (U-tube), which arise when drilling with seawater/light mud below shoe on casing set immediately above top of reservoir. Flow occurs due to insufficiently cemented or isolated shoe.
	ACTION	Activities other than drilling and production should cease. Consider stopping well service operations until the situation is clarified.
	NOTES	Weakened primary barrier.

7-M	SITUATION	Pack-off and loss of return ('well breathing') during drilling in overburden with subsequent influx of lost drilling fluid. ¹
	ACTION	Depending on the situation, the stopping of other activities in the drilling areas where gas may be present should be considered, e.g. hot work.
	NOTES	The integrity of the formation has changed. No weakening of barrier.
8-M	SITUATION	The gas level exceeds x% of the lower explosive limit (LEL) measured on shaker. Value must be established by the individual company based on the reservoir, mudlogging system, detector type, etc.
	ACTION	Hot work in related areas shall be stopped. Assess compatibility with other activities.
	NOTES	No barriers are lost.
9-M	SITUATION	Failure in BOP control. Unable to close rams or annular valve. Formations that can flow are not exposed (e.g. cemented and tested liner).
	ACTION	No need to shut down other activities as long as well is stable and there are no exposed formations that may flow.
	NOTES	Loss of secondary barrier. The well must be secured immediately using a plug or equivalent before the BOP is repaired.
10-M	SITUATION	Pressure build-up over design criteria due to communication from other wells (greatest probability during P&A).
	ACTION	Shut in affected wells. Consider further production shutdowns. Consider stopping other activities.
	NOTES	Loss of integrity.
11-L	SITUATION	Lost circulation/drilling fluid. Manage to keep well full of drilling fluid.
	ACTION	Simultaneous activities may continue.

¹ This is not a well kick situation

	NOTES	No barriers are lost.
12-L	SITUATION	Failure on BOP barrier element. At least <u>one</u> element below the failed element is functioning normally and will hold pressure.
	ACTION	Simultaneous activities may continue.
	NOTES	No barriers lost.
13-L	SITUATION	Leak in flange or riser below lowest barrier element in BOP. Formations that can flow are not exposed (e.g. cemented and tested liner).
	ACTION	Simultaneous activities may continue.
	NOTES	Loss of secondary barrier (BOP), integrity (two independent barriers) maintained as long as formations that can flow are not exposed.
14-L	SITUATION	Influx in connection with perforation in P&A operation, within design criteria for well and surface equipment. Flow occurs due to expected pressure from exposed formation after perforation, and is a combination of gas from perforation and/or from formation.
	ACTION	Hot work in exposed areas shall be stopped. Assess compatibility with other activities. Hot work may be resumed when there is no longer a risk of gas.
	NOTES	Weakened primary barrier. Integrity maintained using BOP until gas is circulated out. Barriers re-established in accordance with procedure in that fluid column can maintain hydrostatic pressure in the well.
Well intervention/First phase Plug&Abandon		
15-H	SITUATION	Well intervention – cannot operate Christmas tree valves, well intervention BOP valves and DHSV has been pulled out or cannot be operated.
	ACTION	All other activities shall cease until the barriers are re-established. Production and gas lift above relevant platform

		shall be shut down. Automatic pressure relief shall be considered.
	NOTES	Loss of secondary and tertiary barriers.
16-H	SITUATION	Well intervention – cannot operate Christmas tree valves, well intervention BOP valves. DHSV is intact and can be verified/tested in closed position.
	ACTION	All other activities shall cease until DHSV confirmed closed.
	NOTES	Loss of secondary barrier (BOP), integrity ensured by DHSV.
17-H	SITUATION	Coiled tubing – breach in coil at surface and check valves in BHA fail.
	ACTION	All other activities shall cease until the barrier is re-established. Production and gas lift above relevant platform shall be shut down. Automatic pressure relief shall be considered.
	NOTES	Loss of primary barrier.
18-H	SITUATION	Coiled tubing – Leak in riser under shear seal.
	ACTION	All other activities shall cease until the barrier is re-established. Production and gas lift above relevant platform shall be shut down. Automatic pressure relief shall be considered.
	NOTES	Loss of primary barrier.
Production		
19-H	SITUATION	Well producing – XMV and DHSV and MMV leaking above internally defined leakage criteria. AFV is closed.
	ACTION	Other activities (outside production) in the area shall be stopped, area shall be cordoned off. Prepare for well kill.

	NOTES	Loss of primary barrier (DHSV) and secondary barrier (XMV and MMV).
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