UNITED STATES DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE
GULF OF MEXICO OCS REGION

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NOTICE TO LESSEES AND OPERATORS OF FEDERAL OIL, GAS, AND SULPHUR LEASES IN THE OUTER CONTINENTAL SHELF, GULF OF MEXICO OCS REGION

Managed Pressure Drilling Projects

This Notice to Lessees and Operators (NTL) provides guidance to ensure that you use and maintain equipment and materials necessary to ensure the safety and protection of personnel, equipment, natural resources, and the environment in compliance with 30 CFR 250.401(e) when you conduct a managed pressure drilling (MPD) project in the Gulf of Mexico OCS for wells with surface blowout preventers (BOP). It also specifies the information you need to include in the drilling prognosis section (see 30 CFR 250.414(h)) of your Application for Permit to Drill (APD) when you request approval for alternative compliance under 30 CFR 250.408 to conduct an MPD project. The Minerals Management Service (MMS) Gulf of Mexico OCS Region (GOMR) developed this NTL (including the Appendix and its attachment) with the input and cooperation of the International Association of Drilling Contractors (IADC) Committee for Underbalanced Operations and Managed Pressure Drilling.

Intent

The intent of this NTL is to encourage proactive planning and provide a consistent approval process before you implement MPD. Be advised that any MPD implementation or contingency implementation of MPD requires prior MMS GOMR review and approval. This NTL addresses MPD as it applies to drilling with surface BOP's. It will be reviewed for revision when the IADC completes its recommended practice for MPD for both surface BOP's and subsea BOP's.

This NTL specifically addresses the Constant Bottomhole Pressure (CBHP) variation of MPD as defined in the IADC Underbalanced Operation (UBO) & MPD Glossary of Terms, where bottomhole pressure is kept constant during connections to compensate for the loss of annulus friction pressure when mud pumps are off. Other MPD variations or systems that fall outside of this definition warrant a review by the MMS GOMR.

This NTL does not preclude the use of rotating control devices (RCD) to augment safety systems and methods, such as those to divert return flow away from the drill floor or to control ballooning. Address any other application of RCD or specialized equipment in the APD.

This NTL does not preclude the use of bottom hole pressure monitoring devices while drilling and/or having closed loop drilling fluid flow monitoring systems on mobile offshore drilling

units (MODU) with subsea BOP's. Nor does it preclude you from submitting an APD to drill a well using MPD from a MODU with subsea BOP's. Be advised, however, that there are numerous additional factors to be considered when you conduct MPD drilling with a subsea BOP that are not addressed in this NTL.

Definition

As taken from the IADC UBO and MPD Committee:

Managed Pressure Drilling (MPD) means an adaptive drilling process used to control precisely the annular pressure profile throughout the wellbore. The objectives are to ascertain the downhole pressure environment limits and to manage the annular hydraulic pressure profile accordingly. MPD is intended to avoid continuous influx of formation fluids to the surface. Any flow incidental to the operation will be safely contained using an appropriate process.

1. MPD process employs a collection of tools and techniques which may mitigate the risks and costs associated with drilling wells that have narrow downhole environmental limits, by proactively managing the annular hydraulic pressure profile.
2. MPD may include control of back pressure, fluid density, fluid rheology, annular fluid level, circulating friction, and hole geometry, or combinations thereof.
3. MPD may allow faster corrective action to deal with observed pressure variations. The ability to control annular pressures dynamically facilitates drilling of what might otherwise be economically unattainable prospects.

For the purpose of this NTL, MPD is limited to maintaining an overbalanced state in a closed system within the drilling process through the use of mud density and annulus friction pressure, using either equivalent circulating densities and/or casing back pressure with a statically underbalanced mud system. When you use trapped casing back pressure, provide for the ability to maintain and/or increase pressure at all times.

Planning

Contact the drilling engineer in the appropriate MMS GOMR District Office as soon as you make the decision to conduct an MPD project. MPD projects, especially those proposed by lessees and operators that have not yet used approved MPD techniques, normally require from four to six months of interaction with MMS GOMR personnel while you conduct preliminary engineering assessments, develop plans and contingencies, plan hydraulics, assemble equipment, and conduct training exercises.

APD Information

Under 30 CFR 250.408, the MMS GOMR can approve alternative procedures or equipment only if they provide a level of safety and environmental protection that equals or surpasses current MMS requirements. Therefore, your APD to conduct an MPD project needs to contain sufficient information for the MMS GOMR to review and assess the merits and operational safety and environmental aspects of any alternative drilling procedures fully and completely. Accordingly, include the following information in the list and description of alternative procedures required by 30 CFR 250.414(h) in the drilling prognosis section of your APD:

1. A description of your hydraulics model and detailed schematics for all surface piping and downhole equipment configurations supporting the model. Make sure that you model downhole characteristics and the surface flow control systems (FCS) using a range of anticipated fluid properties. Explain how you will compare your model against actual drilling data and make adjustments during operations. Show how you will adjust the model if formation pressures deviate from the expected during drilling operations.

2. An explanation and discussion of all drilling concerns, including the rationale for using non-conventional drilling technology. Include details of the items that will be impacted by the tight pressure margins and a discussion of your plans to commence non-conventional circulation. Also include

a. Pressure prognosis plots with pore pressures and fracture pressures through the interval(s) where you request alternative compliance;

b. Geologic technical data examining the risks of abnormalities or geologic uncertainties, and the probabilities of larger differences in pore pressure and fracture pressures;

c. Casing design calculations with safety factors;

d. Proposed schematics of all FCS equipment, including footprints and design considerations;

e. Surface circulation system design specifications and redundancies, specifically for MPD implementation;

f. If you plan to drill through a production riser, its description and detailed specifications;

g. Your plans to functionally test onshore all critical equipment associated with the MPD procedure (e.g., the pump skid, flow meter skid, choke manifold) before rig mobilization, if possible. Undertake this work on the first application for such equipment on a multiple well application on the drilling rig. Previously approved designs of FCS will satisfy this condition for a lessee or operator who has used this system previously in the Gulf of Mexico;

h. Your plans to install and operationally test the MPD equipment at the drilling rig on its first application; and

i. A description of the methods you will deploy to detect variations of drilling flow rate. Include discussions of trip tank and pit system procedures; mud return flow trending; the use of flow meters and monitoring of same; logging tools, including measurement while drilling (MWD), pressure while drilling (PWD), and logging while drilling (LWD); gas detection equipment installed; mud sampling procedures; and rheology monitoring.

3. An explanation of the basis for your drilling rig selection, considering the additional MPD equipment required. Include the following:

a. When drilling from a floating production facility with surface BOP’s, provide a discussion of how heave, roll, and pitch issues may impact the rig and production riser during inclement weather conditions;

b. A discussion of deck space requirements for the additional MPD equipment, along with any considerations for deck restrictions or load restrictions near or around the moon pool area, and set back distances in the drill floor area; and

c. A discussion of fluid/gas separation capabilities.

4. A discussion of equipment and procedures you will use during MPD operations to include

a. An operational matrix such as that shown in the Appendix of this NTL, specifying when you will adjust your drilling parameters and when you will begin well control activities;

b. A maintenance and testing schedule of all related equipment. Make sure that initial tests are at least to the planned operating pressures;

c. An independent surface choke manifold to control flow from the wellbore;

d. A specific means to apply additional back pressure to the well bore during connections;

e. A system to detect variations in drilling flow rate or influx volume continuously;

f. Instrumentation for measuring bottomhole pressure. If specified instrumentation malfunctions or fails, your plans to notify the appropriate MMS District Manager, who must approve alternate procedures before you continue drilling with MPD;

g. At least one float in the bottom-hole assembly to prevent influx up the drill pipe;

h. A mud gas separator with adequate capacity for the intended drilling program;

i. Hydraulic/electric/pneumatic pressure controls; and

j. A description of the equipment and procedures you will employ to provide functional redundancy in the FCS, which may include an RCD, mud pumps, chokes, flow meters, and flow detection instrumentation.

5. Plans for you and your contractors to hold a hazard identification (HAZID)/hazard and operability (HAZOP) workshop that includes provisions for

a. Identifying hazards for all drilling and connection activities and assessing risks;

b. Developing mitigation measures and contingencies;

c. Reviewing drilling flow rate variation detection procedures;

d. Reviewing well control procedures. Include your provisions to revert to the well control system (BOP, primary choke manifold, etc.) should you detect a formation influx outside of the parameters specified in your well control matrix.

e. Classifying wells based on risk level, application category, and fluid system and using that classification system to provide a framework for defining minimum equipment needs, specialized procedures, and safety management practices. Guidance can be found in "IADC Well Classification System for Underbalanced Operations and Managed Pressure Drilling" or in "IADC Underbalanced Drilling Operations – HSE Planning Guidelines."

6. Your plans to provide competency assurance for all involved personnel. Describe the supplemental training you will provide for all identified relevant personnel engaged in MPD operations to ensure that they understand their role in MPD, are familiar with the equipment, and can properly perform their assigned duties.

Guidance Document Statement

The MMS GOMR issues NTL's as guidance documents in accordance with 30 CFR 250.103 to clarify, supplement, and provide more detail about certain MMS regulatory requirements and to outline the information you provide in your various submittals. Under that authority, this NTL sets forth a policy on and an interpretation of a regulatory requirement that provides a clear and consistent approach to complying with that requirement. However, if you wish to use an alternative approach for compliance, you may do so, after you receive approval from the appropriate MMS GOMR office under 30 CFR 250.408.

Paperwork Reduction Act (PRA) Statement

The collection of information referred to in this NTL provides clarification, description, or interpretation of requirements in 30 CFR 250, subpart D. The Office of Management and Budget (OMB) has approved the information collection requirements for these regulations and form and assigned OMB control number 1010-0141. This NTL does not impose additional information collection requirements subject to the PRA.

Contact

If you have any questions regarding this NTL, contact Russell Hoshman of the MMS GOMR Technical Assessment and Operations Support Section by telephone at (504) 736-2627, or by e-mail at russell.hoshman@mms.gov.

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Lars T. Herbst
Regional Director

Appendix with Attachment

Appendix

Managed Pressure Drilling Operations Matrix

The following matrix describes when you will proceed to corrective measures to bring any influx into control when performing MPD operations. See the Attachment to this Appendix for examples of influx and surface pressure indicators.

MPD Drilling Matrix		**Surface Pressure Indicator** (See Chart 2 Below)			
		At Planned Drilling Back Pressure	**At Planned Connection Back Pressure**	**> Planned Back Pressure & < Back Pressure Limit**	**≥ Back pressure Limit**
Influx Indicator (See Chart 1 Below)	**No Influx**	Continue Drilling	Continue Drilling	Increase pump rate, mud weight, or both AND reduce surface pressure to planned or contingency levels	Pick up, shut in, evaluate next action
	Operating Limit	Increase back pressure, pump rate, mud weight, or a combination of all	Increase back pressure, pump rate, mud weight, or a combination of all	Increase pump rate, mud weight, or both AND reduce surface pressure to planned or contingency levels	Pick up, shut in, evaluate next action
	< Planned Limit	Cease Drilling. Increase back pressure, pump rate, mud weight or a combination of all	Cease Drilling. Increase back pressure, pump rate, mud weight or a combination of all	Pick up, shut in, evaluate next action	Pick up, shut in, evaluate next action
	≥ Planned Limit	Pick up, shut in, evaluate next action	Pick up, shut in, evaluate next action	Pick up, shut in, evaluate next action	Pick up, shut in, evaluate next action

Chart 1				
Influx Indicator	**Defined Limits for**		**_____ Interval**	**_____ ft to _____ ft TVD**
	Influx State	No Influx	None	
		Operating Limit	Low	
		< Planned Limit	Medium	
		≥ Planned Limit	High	
	Influx Rate	No Influx	None	
		Operating Limit	Light	
		< Planned Limit	Moderate	
		≥ Planned Limit	High	
	Influx Duration	No Influx	None	
		Operating Limit	Low	
		< Planned Limit	Medium	
		≥ Planned Limit	High	
	Volume Gain	No Influx	None	
		Operating Limit	Low	
		< Planned Limit	Medium	
		> Planned Limit	High	

Notes:
1. Influx indicator can be any or a combination of the factors shown in Table 1.

2. Pit gain is an absolute indicator.
3. Equipment must be used which can measure the influx rates to an acceptable tolerance.

Chart 2		
Defined Limits for _____Interval _____ft to _____ft TVD		
Surface Pressure Indicator	Planned Drilling Back Pressure	
	Planned Connection Back Pressure	
	Back Pressure Limit	

Note: Equipment must be used which can measure the surface pressures to an acceptable tolerance.

Other Indicators	
Defined Limits for _____Interval _____ft to _____ft TVD	
Well Control Triggers	

Note: “Other Indicators” signal should be considered planned limit and require immediate remedial actions.

Attachment to the Appendix

Managed Pressure Drilling Operations Matrix Examples

Following are descriptions and examples of input for the matrix:

1. Defined Limits - specify which intervals of the wellbore are included for the MPD matrix. Prepare a separate matrix for each interval that requires MPD techniques.

Defined Limits for B Sand Interval 10,000 ft to 10,500 ft TVD

2. Influx State - describe in terms of flow characteristics. Specifically, describe the limitations when the well is flowing at a steady state as opposed to increasing flow.
   Example:

Influx State	No Influx	None	No measured influx
	Operating Limit	Light	Flow measured at a steady state
	< Planned Limit	Medium	Flow continuing to increase
	> Planned Limit	High	Flow increasing despite remedial actions

3. Influx Rate - describe in terms of flow rate. Specifically, describe the maximum influx rates that you will see before proceeding to corrective measures.
   Example:

Influx Rate	No Influx	None	No measured influx
	Operating Limit	Light	< 0.1 bbl/min
	< Planned Limit	Moderate	< 1.0 bbl/min
	> Planned Limit	High	> 1.0 bbl/min

4. Influx Duration - a function of the duration of the returns. Specifically, list the length of time you will take an influx before you proceed to corrective measures.
   Example:

Influx Duration	No Influx	None	No measured influx
	Operating Limit	Low	< 1 min, light influx
	< Planned Limit	Medium	< 10 min, light influx or < 1 min moderate influx
	> Planned Limit	High	> 10 min, light influx or > 1 min moderate influx

5. Pit Gains - describe the maximum measured influx (volume in bbls) that you will receive before you proceed to corrective measures.
   Example:

Volume Gain	No Influx	None	No measured pit gains
	Operating Limit	Low	< 0.5 bbl
	< Planned Limit	Medium	< 1.0 bbl
	> Planned Limit	High	> 1.0 bbl

6. Surface Pressure Indicator - describe the maximum measured pressure that is applied to the surface choke manifold. List the planned back pressure to be held during MPD drilling operations, if any, and the maximum planned pressure to be held during connections. Also, list the back pressure limit as the maximum that will be held back using the surface equipment. Any higher pressures necessitate securing the well with the blowout preventers (BOP).

Surface Pressure Indicator	Planned Drilling Back Pressure	0 psi or 0 pounds per gallon (ppg) mud weight
	Planned Connection Back Pressure	382 psi or 0.7 ppg mud weight (anticipated ECD)
	Back Pressure Limit	1092 psi or 2.0 ppg mud weight (based on RCD)

7. Other Indicators - operator specified items that will initiate immediate suspension of operations.

Other Indicators	
Well Control Triggers	Ambient hydrocarbon gas detected
	Hydrocarbon gas or fluid leak detected
	Drilling fluid leak detected, uncontrolled
	RCD rubber leaking and any influx detected