

## Chapter 6 | Regulatory Observations

The Commission's full report examines in depth the history and current status of Minerals Management Service (MMS) regulatory programs, and makes specific recommendations for regulatory reform.\* In Chapter 3 of that report (displayed in Figure 6.1), the Commission finds that:

- MMS had a built-in financial incentive to promote offshore drilling that was in tension with its mandate to ensure safe drilling and environmental protection;
- revenue increases dependent on deepwater drilling came with increased safety and environmental risks, but those risks were not matched by greater, more sophisticated regulatory oversight;
- MMS was unable to maintain up-to-date technical drilling-safety requirements to keep up with industry's rapidly evolving deepwater technology. As drilling technology evolved, many aspects of drilling lacked corresponding safety regulations; and
- at the time of the blowout, MMS systematically lacked the resources, technical training, or experience in petroleum engineering that is critical to ensuring that offshore drilling is being conducted in a safe and responsible manner.

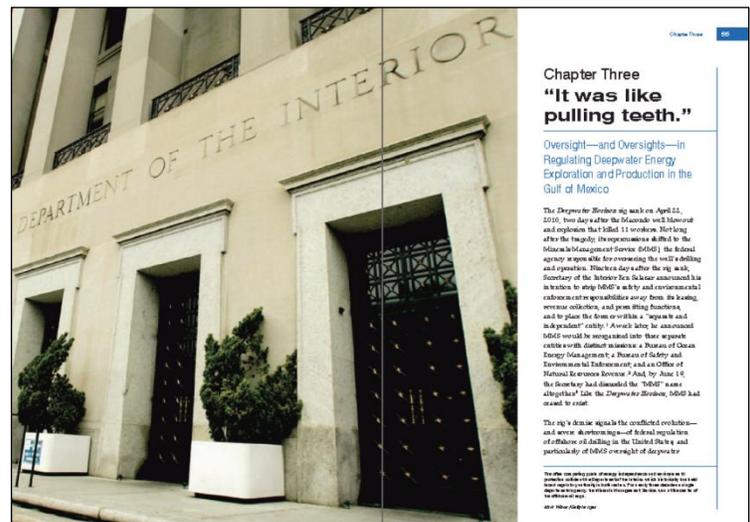
This portion of the Chief Counsel's Report is more modest. It focuses solely on the role that MMS regulations in force at the time of the blowout played in guiding design and process decisions at Macondo.

### MMS Background

MMS, now the Bureau of Ocean Energy Management, Regulation, and Enforcement, employs approximately 600 individuals to run operations in the Gulf of Mexico region.<sup>1</sup> About one-fifth of that staff is distributed among five district operations offices. Each district office has a small

\* The Minerals Management Service (MMS) was renamed the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEMRE) on June 18, 2010. For ease of reference, this Report uses the former name, MMS.

Figure 6.1. Chapter 3 of the Commission's full report.



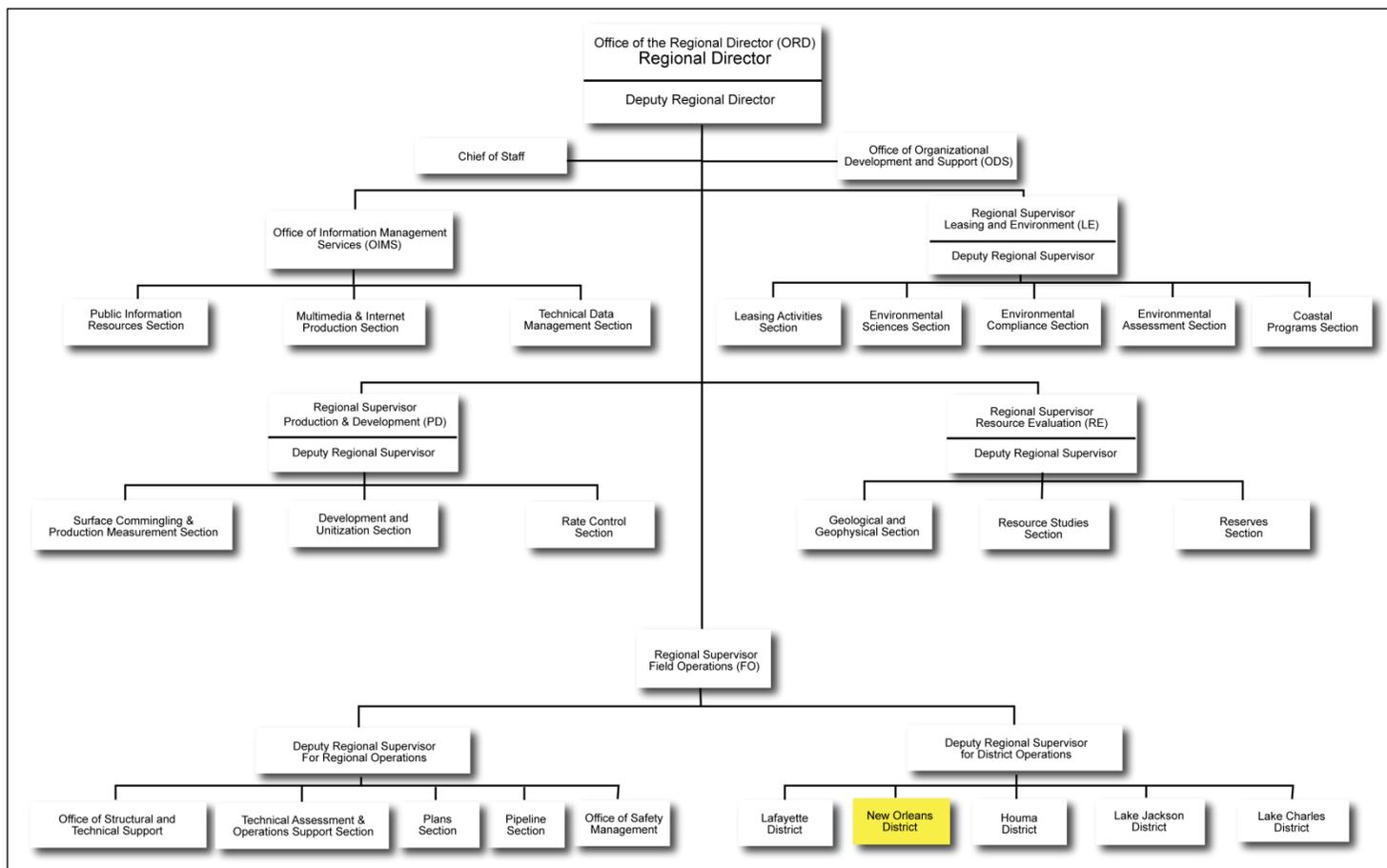
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cadre of engineers, including drilling engineers. Drilling engineers review drilling permit applications.

The MMS office that supervised drilling in Mississippi Canyon Block 252 was the New Orleans District office. The New Orleans District office (in the bottom row of Figure 6.2) reviewed 25% to 30% of all permits submitted for the Gulf of Mexico.<sup>2</sup> The office had one designated drilling engineer for the review of permits. That individual thus reviewed several hundred permits each year<sup>3</sup> and approved BP's initial application for permit to drill (APD) a well at Macondo, as well as subsequent applications modifying that permit.

**Figure 6.2. BOEMRE organizational chart for the Gulf of Mexico region in July 2010.**



TrialGraphix

The New Orleans District office supervised drilling in the region of the Gulf of Mexico that contained the Macondo well.

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**APD and APM.** An operator's first submission to the MMS for permission to begin drilling is an **application for permit to drill, or APD**. Subsequent changes to the initial permit are requested through an **application for permit to modify, or APM**.

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MMS regulations are located in title 30 of the Code of Federal Regulations, parts 201 to 299. The regulations governing review and approval of drilling operations are primarily located in part 250.

## MMS Regulations Did Not Address Many Key Risk Factors for the Blowout

MMS regulations in force at the time of the Macondo blowout did not address many of the key issues that the Chief Counsel's team identified as risk factors for the blowout.

### Deepwater Drilling Conditions

At the time of the blowout, most MMS prescriptive and performance-based regulations applied uniformly to all offshore wells regardless of their depth. The regulations did not impose additional or different performance requirements for deepwater wells. Indeed, MMS personnel stated that it had become routine for them to grant certain specific exemptions from regulatory requirements, mostly related to blowout preventer (BOP) testing, in order to accommodate the needs of deepwater operations.<sup>4</sup>

While MMS regulators routinely reviewed an operator's predictions about shallow drilling hazards, they did not review an operator's predictions of drilling conditions in deeper areas.<sup>5</sup> For instance, while MMS regulations required operators to submit predicted pore pressure and fracture gradient charts along with well permit applications,<sup>6</sup> MMS personnel did not review the data in those charts, let alone verify, for example, whether the predictions aligned with offset data from other wells in the area. MMS personnel were not aware of any instances in which the agency had rejected a permit application because of questionable predictions regarding subsurface conditions. (Indeed, MMS personnel rarely questioned any statements or predictions contained in permit applications.<sup>7</sup>)

MMS regulations did require BP to submit for approval all of the well design changes that it made in response to drilling conditions or external events.<sup>8</sup> As a result, BP submitted more than 10 separate drilling permit applications for Macondo. For instance, BP submitted a revised permit application after Hurricane Ida forced BP to replace the *Marianas* with the *Deepwater Horizon*.<sup>9</sup> It submitted additional revisions after it was forced to stop drilling when the March 8, 2010 kick caused a stuck drill pipe and forced BP to continue drilling with a sidetrack.<sup>10</sup> BP also submitted revised casing schedules each time drilling conditions required it to alter its overall casing plan. BP did not always explain the need for well design changes. For instance, it did not specifically explain to MMS that it decided to stop drilling earlier than planned and declare a shallower total depth because of the early April lost returns event.

## Well Design

At the time of the Macondo blowout, MMS regulations covered only very basic elements of well design. The regulations required operators to submit information on the pore pressure and fracture gradient they expected to encounter, and the maximum pressures to which they expected casing strings and well components to be exposed.<sup>11</sup> The regulations also required operators to specify the weight, grade, and pressure ratings of casing they planned to install, and generally to ensure that casing would “[p]roperly control formation pressures and fluids.”<sup>12</sup>

MMS regulations did not authorize, prohibit, or restrict the use of long string production casings. They did not specify any minimum number of annular barriers to flow. They did not address any issues related to annular pressure buildup (APB), nor authorize or prohibit any particular APB mitigation approaches. Regulations did not specify design measures that would facilitate containment or capping measures in the event of a blowout; for instance, the regulations did not address the use of burst or collapse disks in casing design, nor require the use of a protective casing. (Chapter 4.2 discusses these issues in greater detail.)

In several instances, MMS personnel involved at Macondo recognized risks that might be posed by certain Macondo design features or advantages of certain design features not used at Macondo. In each instance, however, the individuals refrained from suggesting or requiring changes. They explained that their role was to check compliance with specific regulatory requirements and not to provide more generalized design advice to operators. One explained that if he were to recommend for or against a particular well design or design feature, he might be held responsible if that approach caused problems.<sup>13</sup>

## Cementing Design

MMS regulations contained several provisions that address the use of cement in offshore oil wells, but they were quite general. MMS personnel identified four regulations that address cement and cementing: 30 C.F.R. § 250.415, 420, 421, and 428. Section 250.415 states only that an operator must discuss in its cementing program the type and amount of cement it plans to use. Section 250.420 adds little of relevance: It provides that cement “must properly control formation pressure and fluids.” Section 250.421 is the most prescriptive: It specifies minimum cementing volume requirements for each type of casing (conductor, surface, intermediate, and production) and states that for a production casing, cement must extend at least 500 feet above all hydrocarbon-bearing zones.

MMS personnel stated that the only cementing requirement they routinely policed was the linear coverage requirement in 30 C.F.R. § 250.421.<sup>14</sup> The Chief Counsel’s team noted, however, that BP’s permit applications did not contain information that would allow meaningful review of this issue. While BP’s permit applications did include the height of the top of the cement column, they did not include the height of the top hydrocarbon-bearing zone. Without this information, it would be difficult to determine whether BP planned to pump enough cement to cover the annular space 500 feet above that zone.

MMS cementing regulations did not address several issues that proved important at Macondo.

- The regulations did not require the use of casing centralizers, nor specify minimum standoff percentages or other centralization criteria.

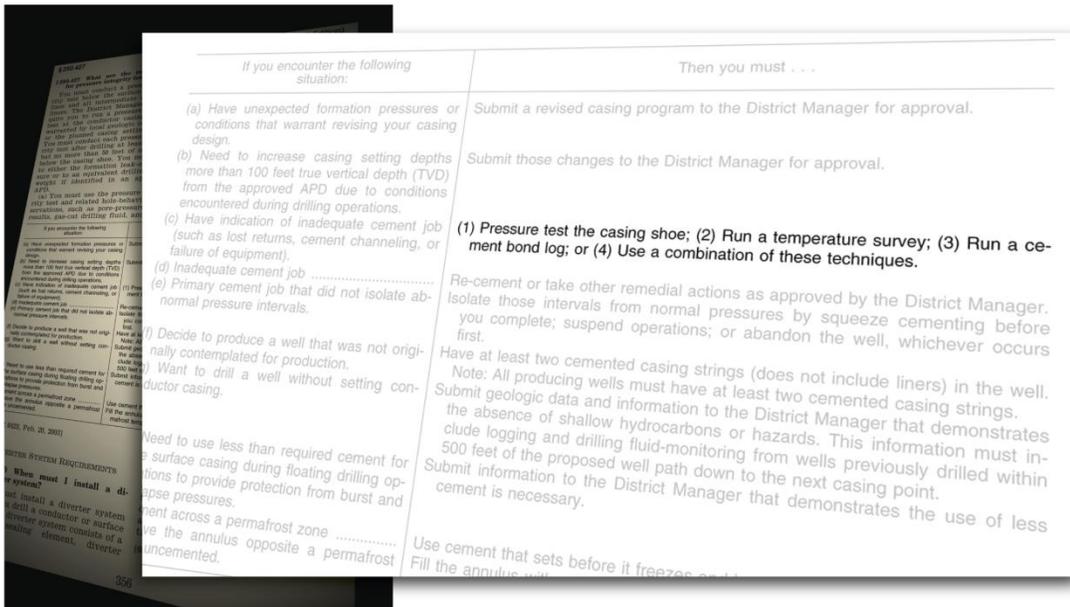
- The regulations did not address the possibility of cement contamination, nor specify any measures to reduce the likelihood of contamination (such as the use of wiper plugs or spacer fluids).
- While at least one regulation recommended the use of float valves,<sup>15</sup> the regulations did not specify whether or how to evaluate float valve conversion or performance.
- The regulations did not require BP to conduct or report cement slurry tests, nor specify any criteria for test results.
- The regulations did not address the use of foamed cement (or any other specialized cementing technology) at all. The regulations did not require BP to inform MMS that it would be using foamed cement, nor specify any technical criteria for foamed cement or foamed cement testing.

## Cement Evaluation

Section 250.428 of the MMS regulations (displayed in Figure 6.3) is the only one that addresses directly the possibility of a failed cementing job. That section states that if an operator has “indications of an inadequate cement job (such as lost returns, cement channeling, or failure of equipment)” the operator should:

1. Pressure test the casing shoe;
2. Run a temperature survey;
3. Run a cement bond log; or
4. Use a combination of these techniques.

**Figure 6.3. MMS regulation 30 C.F.R. § 250.428.**



This regulation applied at Macondo but had little practical effect. The pressure and volume indicators that rig personnel examined did not provide any “indications of an inadequate cement job” during the cementing process at Macondo. But as discussed in [Chapter 4.3](#), these indicators provide little direct information about cementing success. And while the regulation states that indications of “cement channeling” should trigger remedial efforts, it is extremely difficult to determine if cement has channeled based on surface indicators. Finally, the regulation’s remedial measure requirement is quite modest; MMS personnel admitted that an operator could satisfy it by conducting a *positive* pressure test on the casing shoe,<sup>16</sup> even though such a test would not examine cementing success. (As [Chapter 4.6](#) explains, BP did conduct a positive pressure test after cementing.)

## Negative Pressure Test Procedures

The most notable gap in MMS regulatory structure at the time of the incident was the lack of any regulation requiring negative pressure tests before temporary abandonment.

Representatives of the companies involved and other industry experts uniformly agreed that it is crucial to negative pressure test wells like Macondo before temporary abandonment. But while MMS regulations contain numerous requirements for pressure tests, such as 30 C.F.R. § 250.423 and 250.426, they do not require negative pressure tests on any well, let alone specify how such tests should be done.<sup>17</sup> (In its April 16, 2010 application for permit to modify, or APM,<sup>18</sup> BP told MMS that it would conduct a negative pressure test.)

Since the blowout, MMS has promulgated interim regulations that would require negative pressure tests. MMS regulation 30 C.F.R. § 250.423(c) not only requires negative pressure tests on intermediate and production casing strings, but it also requires operators to submit test procedures and criteria with their APD to MMS. It also requires all test results to be recorded and available for inspection.<sup>19</sup> While this regulation does not specify how the test is to be conducted or interpreted, the requirement to file procedures and criteria may prompt operators to establish best practices.<sup>20</sup>

The Chief Counsel’s team notes that negative pressure tests are not necessary at every well. Some operators make a practice of ensuring that wells are “overbalanced” even after they remove the riser and, with it, the balancing pressure generated by the mud column in the riser. (This pressure is called the “riser margin.”) If a well is overbalanced, hydrocarbons cannot flow out of the formation into the well even if bottomhole cement and any casing plugs were to fail. Negative pressure tests are therefore not necessary for overbalanced wells.

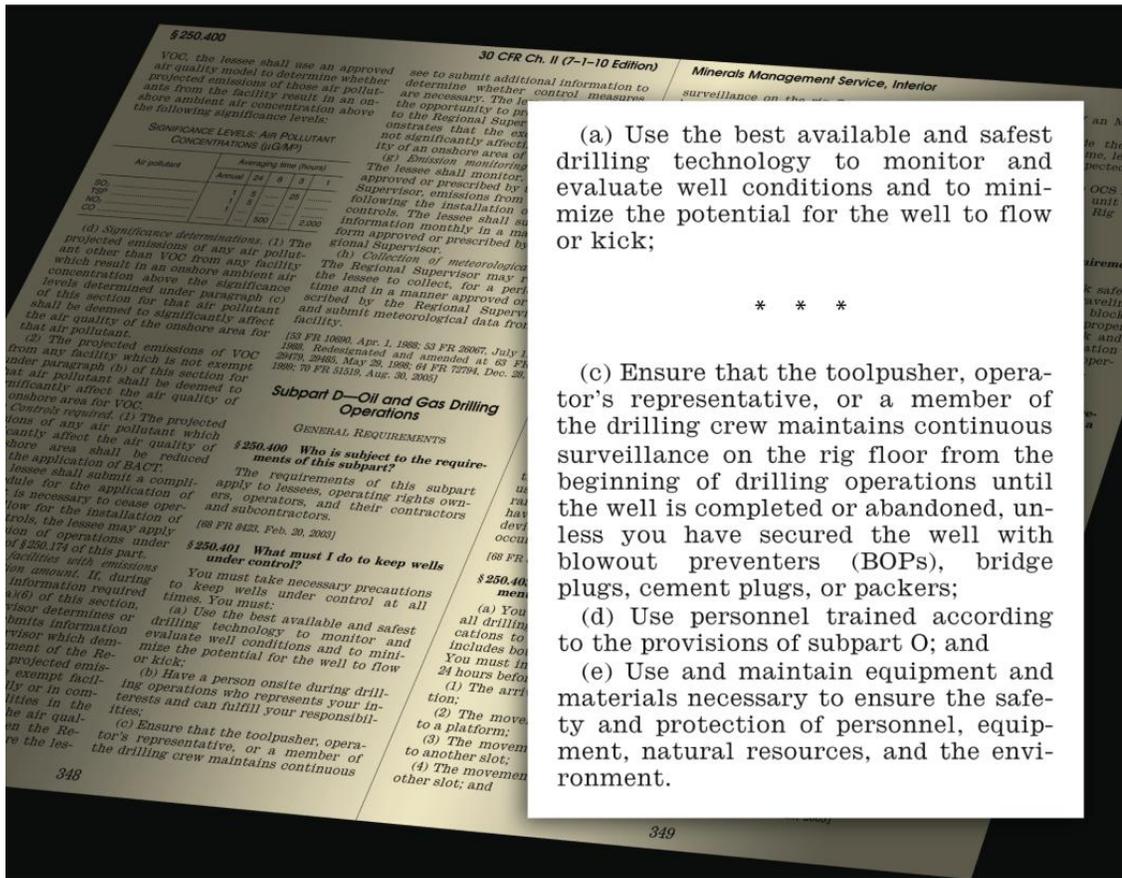
## Well Control

MMS regulations do address the importance of well control. Notably, 30 C.F.R. § 250.401 (displayed in [Figure 6.4](#)) required operators to:

- “Use the best available and safest drilling technology to monitor and evaluate well conditions and to minimize the potential” for a kick. Section 250.105 defines the term “best available and safest technology” to mean technologies that the MMS director “determines to be economically feasible wherever failure of equipment would have a significant effect on safety, health, or the environment.”

- Ensure that the drilling crew “maintains continuous surveillance on the rig floor” from the start of drilling operations until the well is temporarily or permanently abandoned, unless the well is shut in with BOPs.
- Use personnel who have received well control training that meets regulatory requirements.
- “Use and maintain equipment and materials necessary to ensure the safety and protection of personnel, equipment, natural resources, and the environment.”

Figure 6.4. MMS regulation 30 C.F.R. § 250.401.



MMS

The Chief Counsel’s team observed that all key personnel involved in the blowout had received MMS-approved well control training. However, the training they received appears to have focused primarily on initial kick response during drilling operations—that is, on the process of shutting in a well and circulating the kick out. Numerous individuals stated that well control training typically does not involve extensive instruction in the subtleties of kick detection and kick indicators. Additionally, as discussed further in Chapter 4.8, the training does not appear to have covered the proper emergency response to full-scale blowouts.

Despite the aspirational language of the “best available and safest technology” requirement, the *Deepwater Horizon* rig did not include any devices designed specifically to help rig personnel detect the presence of hydrocarbons in the wellbore during nondrilling procedures such as temporary abandonment. The rig’s drilling equipment did include sophisticated instruments that

could detect kicks during the course of actual drilling. But these instruments were part of the rig's bottomhole assembly (the lower part of the drill string). They were not present in the wellbore during cementing and temporary abandonment procedures.

## Temporary Abandonment Procedures

MMS regulation 30 C.F.R. § 250.1721 specifies the requirements that an operator must satisfy before temporarily abandoning a well. The section contains several provisions, but the only one that appears to have guided decision making at Macondo was subpart (d), which states that an operator must: “[s]et a retrievable or a permanent-type bridge plug or a cement plug at least 100 feet long in the inner-most casing” and that the top of the plug must be “no more than 1,000 feet below the mud line.”

BP's last regulatory submission for Macondo was an April 16 APM (seen in Figure 6.5) in which it requested permission to set an unusually deep cement plug 3,000 feet below the mudline—2,000 feet deeper than section 250.1721 would otherwise require.<sup>21</sup> BP made its request by submitting the short numbered list of temporary abandonment procedures discussed in Chapter 4.5. The company stated that it would “[s]et a 300' cement plug (125 cu. ft. of Class H cement) from 8367' to 8067',” explaining its rationale in just 40 words:

The requested surface plug depth deviation is for minimizing the chance for damaging the LDS sealing area, for future completion operations.

This is a Temporary Abandonment only.

The cement plug length has been extended to compensate for added setting depth.

**Figure 6.5. BP's April 16 application for permit to modify.**

Temporary Abandonment Procedure  
Macondo – MC 252 #1  
Deepwater Horizon

Current Status:

Making wiper trip prior to running a long string of 9-7/8" x 7" production casing

Forward Plan:

Run casing to 18,300' +/- per approved APD. Test casing to 2500 psi per approved APD.

Temporary Abandonment Procedure: (estimated start time Sunday, April 18, 2010)

1. Negative test casing to seawater gradient equivalent for 30 min. with kill line.
2. TIH with a 3-1/2" stinger to 8367'.
3. Displace to seawater. Monitor well for 30 min.
4. Set a 300' cement plug (125 cu. ft. of Class H cement) from 8367' to 8067'.  

The requested surface plug depth deviation is for minimizing the chance for damaging the LDS sealing area, for future completion operations.

This is a Temporary Abandonment only.

The cement plug length has been extended to compensate for added setting depth.
5. POOH.
6. Set 9-7/8" LDS (Lock Down Sleeve)
7. Clean and pull riser.
8. Install TA cap on wellhead and inject wellhead preservation fluid (corrosion inhibitor) below TA cap.

BP

MMS granted BP's request less than 90 minutes after BP submitted it.<sup>22</sup> MMS regulation 30 C.F.R. § 250.141 is the regulation that gives MMS officials authority to grant departures from otherwise-applicable regulatory requirements. That regulation states, in relevant part:

You may use alternate procedures or equipment after receiving approval as described in this section...[a]ny alternate procedures or equipment that you propose to use must provide a level of safety and environmental protection that equals or surpasses current MMS requirements.

The Chief Counsel's team asked MMS personnel why they believed that BP's request was appropriate. The individual involved in the decision explained that he granted the request after speaking with BP and learning that BP needed to set the surface plug deep in order to accommodate the setting requirements for its lockdown sleeve. He explained that he viewed it as beneficial for BP set its lockdown sleeve during temporary abandonment procedures but admitted that he had no training or expertise in lockdown sleeve procedures or best practices.<sup>23</sup> Neither MMS individuals nor MMS regulations addressed:

- the fact that BP relied on a single wellbore barrier during temporary abandonment;
- the extent to which BP had underbalanced the well during temporary abandonment activities;
- whether BP could or should set its surface cement plug in drilling mud, or whether BP should satisfy additional requirements before displacing drilling mud from the wellbore in order to set its surface cement plug in seawater;
- whether the BOP could be open during riser displacement operations or plug cementing; or
- whether alternatives besides a deep surface plug could accommodate lockdown sleeve setting requirements.

## BOP Testing

BP applied for and received MMS approval to test several elements of the *Deepwater Horizon* BOP at lower pressures than regulations would normally require. One departure MMS granted allowed BP to test the *Deepwater Horizon's* blind shear ram at the same pressures at which it tested casing.<sup>24</sup> Other departures permitted the rig crew to test the annular preventers at reduced pressures.

MMS regulations required that high-pressure tests for annular preventers equal 70% of the rated working pressure of the equipment or a pressure approved in an APD.<sup>25</sup> BP filed an APD in which it asked permission to reduce testing pressures for the *Deepwater Horizon's* annular preventers to 5,000 pounds per square inch (psi) in October 2009.<sup>26</sup> In January 2010, BP filed an APD asking permission to reduce testing pressures for both annular preventers to 3,500 psi.<sup>27</sup> MMS granted these requests, which were consistent with industry practice.

MMS personnel did occasionally refuse BP's requests for testing modifications. For instance, after dealing with a February lost circulation event, BP asked MMS to allow rig personnel to delay scheduled BOP testing. This would have allowed the crew to immediately run the next casing string, in order to prevent further losses if the lost circulation treatment broke down during testing. On March 10, however, MMS personnel rejected that request.<sup>28</sup>

## General Observations on Macondo Permitting Process

In reviewing BP's permit applications, the Chief Counsel's team noted that several of them included fairly obvious clerical or calculation errors. In some instances, it appears that MMS personnel did not recognize these errors. While none of the errors proved consequential—BP in most cases corrected them before proceeding—the fact that they escaped MMS attention raises

concerns about the thoroughness with which the agency conducted even the relatively modest review it did undertake.

The most notable series of errors comes in three APDs that BP submitted to permit its long string production casing: APDs 9511, 9513, and 9515, filed on April 14 and 15. Among the errors in those APDs are the following:

- **APD 9511:** BP's written well design information states on one page that the company plans to use a single 7-inch long string production casing while another page states that it will use a 9-inch casing. Meanwhile, its well schematic states that it plans to use a tapered long string casing that includes a 9-inch section and a 7-inch section.
- **APD 9513:** BP corrected its mistaken statements about the long string diameter and explained that it would be using a tapered long string casing. However, this submission omitted the 9-inch liner that it had already installed from the well design information. Again, this liner appears in the well schematic.
- **APD 9515:** BP corrected its mistake again, this time noting that the well would include both the prior 9-inch liner and a long string casing tapering from 9 inches to 7 inches.
- **APDs 9511, 9513, 9515:** In all three of these permit applications, BP's written well design information states that it will pump 150 cubic feet of cement to cement the long string production casing in place. That volume equates to just 26 barrels—less than the 60 barrels of cement BP actually planned to pump, and far less than would have been necessary to meet MMS linear coverage requirements.

MMS personnel approved all three of these permit applications despite these errors.

## BOP Recertification

MMS regulation 30 C.F.R. § 250.446(a) requires that BOPs be inspected in accordance with API Recommended Practice 53 § 18.10.3.<sup>29</sup> This practice requires disassembly and inspection of the BOP stack, choke manifold, and diverter components every three to five years.<sup>30</sup> This periodic inspection is in accord with Cameron's manufacturer guidelines, and Cameron would certify when the inspections were completed.<sup>31</sup>

The rig crew and BP shore-based leadership recognized that the *Deepwater Horizon's* blowout preventer was not in compliance with certification requirements.<sup>32</sup> BP's September 2009 audit of the rig found that the test ram, upper pipe ram, and middle pipe ram bonnets were original and had not been recertified within the past five years.<sup>33</sup> According to an April 2010 assessment, BOP bodies and bonnets were last certified on December 13, 2000, almost 10 years earlier.<sup>34</sup> An April 2010 Transocean rig condition assessment also found the BOP's diverter assembly had not been certified since July 5, 2000.<sup>35</sup> Failure to recertify the BOP stack and diverter components within three to five years would appear to have violated MMS inspection requirements.<sup>36</sup>

An MMS inspection of the *Deepwater Horizon* on April 1, 2010 did not mention overdue BOP equipment certification.<sup>37</sup> When visiting a rig, inspectors use a "potential incidents and noncompliance" (PINC) list as an inspection checklist.<sup>38</sup> Although the PINC list contains

guidelines not intended to supersede regulations,<sup>39</sup> inspectors consider the PINC list a comprehensive list of inspection items.<sup>40</sup> Because the list does not include verifying compliance with 30 C.F.R. § 250.446(a),<sup>41</sup> inspectors may simply have not checked whether the *Deepwater Horizon*'s BOP had been disassembled and inspected in accord with regulations.

## Ethical Considerations

In recent years various bodies have concluded that certain MMS offices and programs have violated ethical rules or guidelines. In the wake of the *Deepwater Horizon* disaster, some questioned whether ethical lapses played any role in causing the blowout. The Chief Counsel's team found no evidence of any such lapses. ♠