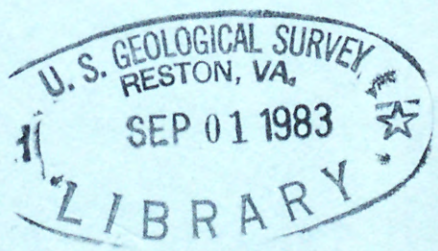
UNITED STATES
DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE

OUTER CONTINENTAL SHELF OIL AND GAS BLOWOUTS

1979 - 1982



TW anal

U.S. Geological Survey
Open File Report 83-562
August 1983

UNITED STATES
DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE

OUTER CONTINENTAL SHELF OIL AND GAS BLOWOUTS

1979 - 1982

By

Mark G. R. Fleury

U.S. Geological Survey
Open File Report 83-562
August 1983

CONTENTS

TABLES

ABSTRACT

On the Outer Continental Shelf (OCS) from 1979 through 1982, 16 blowouts occurred while drilling 4,449 wells, 7 blowouts occurred while completing 2,351 wells, 1 blowout occurred while producing 1,171 million barrels of oil and oil condensate and 19 billion thousand cubic feet (mcf) of gas, and 7 blowouts occurred during workover operations. An average of 3,651 oil and 3,213 gas completions were in operation in 1982. Twenty fatalities and 59 injuries occurred during these blowouts. Reports on the investigations of the four blowouts in which fatalities occurred are available from the Minerals Management Service (MMS). One mobile drilling vessel was destroyed and four were damaged; two platforms were damaged; and two platform rigs were destroyed and one was damaged. Nineteen of the blowouts (61 percent) were controlled within a day, eight (26 percent) required 2 to 7 days to regain control, and only four (13 percent) were out of control for more than a week. Two of the blowouts that occurred during nondrilling operations were responsible for 65 barrels of oil lost into the environment. No identifiable environmental damage was caused by this spillage which represents 0.0000056 percent of the oil produced from the OCS during these 4 years.

ABSTRACT

[illegible] Shell (OCS) [illegible] totalling 4,900 wells. [illegible] blowout occurred while [illegible] and oil condensate and [illegible] blowouts occurred during [illegible] of total oil and [illegible] gas condensate were [illegible] the [illegible] were [illegible] within [illegible] only [illegible] were [illegible] responsible for [illegible] barrels of oil [illegible] the environment. [illegible] environmental damage was caused by [illegible] percent of the oil produced from the OCS during this period.

INTRODUCTION

During oil and gas operations on the OCS, the incident that has caused and has the potential for causing the greatest number of deaths, injuries, property damage or loss, and pollution is the blowout. From 1979 through 1982, only 0.36 percent of the wells started were involved in a blowout incident during drilling operations. A blowout is considered a complete loss of well-control. The loss of control could be momentary, and control could be immediately regained using standard onsite safety equipment and procedures.

During the reporting period from 1979 through 1982, all 31 blowouts occurred in the Gulf of Mexico OCS Region (Table 1). In frontier OCS areas, 91 wells were spudded from 1979 through 1982 without a blowout. These included 11 wells off of Alaska, 30 off the Atlantic coast, 10 in the eastern Gulf of Mexico, and 40 off southern California. Production from the OCS for these 4 years amounted to 1,171 million barrels of oil and oil condensate and 19 billion mcf of gas (Table 2). A total of 4,449 wells were spudded, and 2,351 wells were completed. An average of 6,864 wells were in production in 1982.

Sixteen blowouts occurred during drilling operations and 15 during nondrilling operations. Four blowouts, 0.09 percent of the wells started, caused the 20 fatalities. The MMS prepared public reports, as required by the OCS Lands Act Amendments, for three of these blowouts; the U.S. Coast Guard prepared a report for the fourth. These four reports and reports on three other blowouts are available from the MMS.* Eight blowouts caused a total of 59 injuries. One mobile drilling vessel and two platform rigs were destroyed, and four mobile drilling vessels, two platforms, and one platform rig were damaged.

The duration of the blowouts ranged from an immediate shut-in to 57 days to regain control. Nineteen of the blowouts (61 percent) were controlled within a day. An additional six (19 percent) were controlled in 2 to 3 days. The remaining six blowouts (20 percent) required 6, 7, 19, 30, 45, and 57 days to regain control. Fourteen blowouts bridged naturally (ceased flowing without human intervention) by plugging of the wellbore with formation material such as sand, shale, rock, etc. Eight were controlled using drilling muds, eight were controlled through various mechanical means, and only one (3 percent) required the drilling of a relief well.

Two substances can be responsible for the pressures which cause a blowout--oil and gas. Very shallow gas may occur in unconsolidated sediments at depths of 100 to 500 feet below the mud line. Drilling through these very shallow gas zones requires extreme caution and vigilance. A delicate balance between drilling-mud pressure and formation pressure is necessary to prevent an influx of gas into the wellbore and not fracture the near-surface formations. During exploration and development drilling operations from 1979 through 1982, one blowout (6 percent) occurred at a depth of less than 1,500 feet, and three (19 percent) occurred at depths of 1,500 to 4,000 feet.

*See page 11

Shallow gas and formation fracturing is an even greater potential hazard in deep waters because the drilling-mud column pressure is more difficult to keep in proper balance with the ocean water and overburden pressures. The greatest water depth in which a blowout has occurred on the U.S. OCS was at 430 feet in 1975. However, during 1979 through 1982, no blowouts occurred during the drilling of wells in water depths greater than 400 feet.

The amount of gas escaping during a blowout is difficult to determine. However, during the March/April 1979 blowout on South Marsh Island Block 281, an estimated 2.9 million mcf of gas were lost in the 45 days required to control the blowout. No environmental damage to the ocean waters nor to its life forms resulted from this gas blowout because the released gas was burned or it escaped into the atmosphere.

Minor sheens or slicks were observed during seven blowouts and were due to less than one barrel of condensate precipitated from the escaping gas. In one additional incident, a minor sheen was caused by oil-based drilling mud that blew out of the wellbore with the escaping gas. Two non-drilling blowouts were responsible for the 65 barrels of oil (64 barrels in one incident) that escaped into the environment. No identifiable environmental damage was caused by the incidents. During this 4-year reporting period, oil pollution due to nondrilling blowouts was approximately 1 barrel per 18 million barrels (0.0000056 percent) of oil produced.

BLOWOUTS DURING DRILLING OPERATIONS

Blowouts occurred during the drilling of 16 (0.36 percent) of the 4,449 wells started from 1979 through 1982. The net results were 20 fatalities, 53 injuries, 1 mobile drilling vessel and 2 platform rigs destroyed, and 3 mobile drilling vessels and 1 platform damaged. Twelve of the blowouts bridged (ceased flowing) naturally, three blowouts were controlled with drilling muds, and one was controlled with blind shear rams. The blowouts were out of control for times of less than 1 hour to 45 days. However, only three required 4 or more days to regain control. The minor amounts of hydrocarbons released into the environment were due to condensate from the escaping gas, and in one incident, from the loss of some oil-based drilling mud. Eight of the blowouts occurred during exploration drilling operations, and eight occurred during development drilling operations.

Exploration Drilling

As a result of the eight blowouts (Table 3) occurring during exploration drilling operations, 6 men died and 17 were injured. Three mobile drilling rigs were damaged. None of the four semisubmersible, one submersible, or three jack-up rigs involved were lost. Seven of the blowouts bridged naturally, and one was controlled using drilling muds. Four of the blowouts were controlled in 1 day or less; three required 2 to 3 days to control; one bridged naturally after 19 days.

Development Drilling

As a result of the eight blowouts (Table 4) occurring during development drilling operations, 14 men died and 36 were injured (7 while evacuating platforms). One mobile drilling vessel and two platform drilling rigs were destroyed. Five blowouts bridged naturally, two were controlled using drilling muds, and one was shut-in using blind shear rams. Two blowouts were immediately shut-in, four were controlled in 2 days or less, and two required 7 and 45 days to control.

BLOWOUTS DURING NONDRILLING OPERATIONS

From 1979 through 1982, 15 blowouts occurred during completion, production, and workover operations. The results of the blowouts were six injuries (two while evacuating a platform), one platform and rig damaged, one jack-up rig damaged, and approximately 65 barrels of oil (64 barrels in one incident) lost into the ocean. Only five of the blowouts were out of control for longer than 1 day (2, 3, 6, 30, and 57 days). Only one blowout, out of control for 30 days, required a relief well to regain control. The other 14 blowouts bridged (ceased flowing) naturally (2) or were controlled by drilling muds (5), valves (3), blind shear rams (3), or dry ice to freeze the pipe (1). Seven of the blowouts occurred during completion operations, one during production, and seven during workover operations.

Completion Operations

Blowouts (Table 5) occurred during seven (0.3 percent) of the 2,351 completion operations. Six men were injured during two of the blowouts, and one platform and the rig on it sustained major damage. A relief well was required to control the blowout which lasted 30 days The other six blowouts bridged naturally (one) or were controlled by valves (two), shear rams (two), or dry ice (one). Four of these blowouts were controlled within a day, one required 2 days, and one required 6 days The only pollution resulting from these seven blowouts was a sheen produced by condensate from the escaping gas.

Production Operations

The one blowout (Table 6) that occurred during production operations was 0.015 percent of the average 6,569 completions in operation during 1979 through 1982. This blowout was caused by a leak from a flow line that parted during maintenance work on the subsea completion. The blowout was controlled in 3 days by pumping weighted muds into the wellbore. The leaky equipment was then repaired. Pollution from this incident was a slick caused by an estimated one barrel of escaping oil. This 1 barrel of oil spilled as a result of a blowout during production operations represented 0.000000085 percent of the 1,171 million barrels of oil produced from 1979 through 1982.

Workover Operations

Seven blowouts (Table 7) occurred during workover operations. One jack-up rig was damaged. Six blowouts were controlled in approximately 1 day; the seventh took 57 days. Four blowouts were controlled by pumping mud into the wellbore, one by replacing a bull-plugged outlet with a valve, and one by closing the blind shear rams. One blowout bridged naturally after 57 days. One incident resulted in the loss of 64 barrels of oil. No identifiable environmental damage resulted from this spill.

[illegible] blowouts [illegible] the drilling rig [illegible] one platform and rig [illegible] One jack-up rig damaged, and approximately 17 barrels of oil [illegible] materials in one incident [illegible] percent of the [illegible] blowouts were [illegible] control [illegible] days). Only one blowout, out of control for [illegible] days, required a relief well to regain control. The other [illegible] blowouts bridged (closed) naturally [illegible] or were controlled by [illegible] mud [illegible], valves [illegible] [illegible] of the blowouts [illegible] and [illegible]

Completion Operations

[illegible] blowouts [illegible] occurred during completion [illegible] percent of the [illegible] were [illegible] during two of the [illegible] completions, and one platform and the rig on it sustained major damage. A relief well was drilled to control the blowout which lasted 10 days. The other six blowouts bridged naturally [illegible] or were controlled by valves [illegible], [illegible] (one), or [illegible]. Four of these blowouts were controlled within 1 day, one required [illegible] days, and one required [illegible] day. The only pollution resulting from these seven blowouts was a sheen produced by condensate from the escaping gas.

Production Operations

The one blowout (Table 6) that occurred during production operations [illegible] percent of the [illegible] completions in operation [illegible] through 1985. This blowout was caused by a leak from a [illegible] during wellhead [illegible] work on the [illegible] completions. The blowout was controlled in 3 days by pumping weighted mud into the wellbore. The [illegible] pollution from this incident was [illegible] by an estimated [illegible] barrel of escaping oil. This [illegible] barrel [illegible] as a result of blowouts during production operations [illegible] percent of the [illegible] million barrels of oil produced from 1971 through 1985.

Workover Operations

Seven blowouts (Table 7) occurred during workover operations. One jack-up rig was damaged. Six blowouts were controlled in approximately 1 day; the seventh took 57 days. Four blowouts were controlled by pumping mud into the wellbore, one by replacing a bull-plugged outlet with a valve, one by closing the blind shear rams. One blowout bridged naturally after 57 days. One incident resulted in the loss of [illegible] barrels of oil. No identifiable environmental damage resulted from

CONCLUSIONS

The forecasting of future blowouts is made difficult for several reasons: the time span of the available data is too short; the number of blowouts is too few; the recorded details of the earlier blowouts, geologic hazards, and physical operating environments are too varied; and the technological advancements and improvements in operations have been rapid. This is especially true for the frontier OCS areas. However, by comparing the data for blowouts occurring from 1979 through 1982 with those occurring during earlier periods, some general trends can be seen.

The rate of drilling blowouts per wells spudded shows little overall trend for the past 27 years (Table 8). However, since 1978, the percentage rate of blowouts has been slowing, and fewer blowouts are expected to occur because of MMS emphasis on training programs for OCS employees and improvements in equipment and well-control methods. Since 1978, the MMS has required certain offshore drilling employees to attend a basic well-control training course and a yearly supplemental refresher course. A standard has been developed to provide the minimum criteria for the qualification of drilling personnel in well-control equipment, operations, and techniques to ensure that oil and gas operations on the OCS are conducted in a manner that emphasizes safe operating practices and minimizes the risk of environmental damage. This standard is entitled "Training and Qualifications of Personnel in Well-Control Equipment for Drilling on Offshore Locations." The standard, identified as MMSS-OCS-T 1, is intended for use in the development of training courses for rotary helpers, derrickmen, drillers, toolpushers, and operators' representatives. The standard includes recommendations for testing to ensure that all candidates are qualified upon completion of the course. Each employer is required to maintain a record of training for each employee. A school accreditation program to verify course standards is conducted by the MMS.

The number of blowouts occurring during completion and workover operations has increased in recent years, particularly during completion operations (Table 9). In recognition of this trend, the MMS has developed and published in the Federal Register during July 1983 a proposed, revised and expanded OCS Order No. 6 on well-completion and workover operations. It will implement regulations contained in 30 CFR 250 and will incorporate technological improvements developed since 1970, expand the existing OCS Order No. 6 used in the Gulf of Mexico and Pacific OCS Regions to include workover operations, and provide requirements for these operations in all four OCS Regions. The intended effect of the revised OCS Order No. 6 is to better protect life and property and to further reduce the risk of pollution on the OCS. It will include requirements for well-control equipment systems, wireline operations, equipment testing, safety meetings, and well and fluid monitoring. All requirements of revised OCS Order No. 6 should be in effect by the end of 1984.

The duration of blowouts has been decreasing (Table 10). The proportion of blowouts out of control for 7 days or more has decreased since the early 1970's and is probably a direct result of better blowout prevention equipment and the increased training being given to OCS employees. The occurrence of fatalities and injuries has been sporadic (Table 11). The additional emphasis being placed on safety and training is expected to reduce the number of fatalities and injuries.

Since 1970, no oilspill of one barrel or more has occurred as a result of a blowout during the drilling of 12,167 wells. Further, the amount of oil spilled during nondrilling operations has been decreasing over the past 12 years (Table 12). From December 1974 through October 1981, 54 blowouts occurred with only one, the fourty-fifth in September 1980, resulting in a spill as large as one barrel.

Interest in safety has been increasing. Besides social costs and regulatory policy implications, the economic incentive for improved safety is in itself very strong. Platforms for deepwater areas are already approaching $1.0 billion in costs to build and install.

As industry advances in drilling technology, the MMS is supporting studies on blowout prevention, blowout fire suppression, and the collection of blowout oil before it disperses into the ocean. At the Louisiana State University/Minerals Management Service deep ocean well-control research facility, experiments are being conducted on blowout prevention procedures for emergency situations such as fractured formations and repeated kicks. In addition, methods for transmitting safety-related information from downhole while drilling, and for using computers to process the data and assist in well-control, are being pursued. These latter studies appear especially appropriate to deep ocean drilling where the flow lines to the blowout preventers on the ocean floor are very long and where the danger of formation fracture is more acute. At the National Bureau of Standards, research is progressing on the suppression of blowout fires by flame cooling instead of convention flame blow-off methods. At the Massachusetts Institute of Technology, research on the subsea collection of blowing oil, as it eminates from a wellhead, is under investigation.

The MMS will continue to carefully investigate blowouts occurring in U.S. waters and to monitor reports on foreign blowouts. Six of the blowouts that occurred in U.S. waters from 1979 through 1981 were investigated in detail. The investigation results are given in a U.S. Coast Guard report (Ford, 1979) and in five U.S. Geological Survey Open-File Reports (Bourgeois, 1980 and 1981; Darrow, 1981; Sandridge, 1981; and McDonald, 1983).* A report was also prepared for the High Island Block A-563 blowout that occurred on November 6, 1976 (McDonald, 1977).* To further improve the OCS safety record, the results of these investigations are used to identify operating problems, to evaluate potential solutions, to issue safety alerts, and to revise the appropriate OCS Orders and/or regulations.

* See page 11

SELECTED REFERENCES

Single copies of the following reports are available from the Minerals Management Service, Mail Stop 646, 12203 Sunrise Valley Drive, Reston, Virginia 22091.

Bourgeois, D. J., and others, 1980, Investigation of March 1980 Blowout and Fire, Lease OCS-G 2433, High Island Block A-368, U.S. Geological Survey Open-File Report 80-1278, 47 p.

Bourgeois, D. J., and others, 1981, Investigation of August 1980 Blowout and Fire, Lease OCS-G 4065, Matagorda Island Block 669, U.S. Geological Survey Open-File Report 81-706, 25 p.

Danenberger, Elmer P., 1980, Outer Continental Shelf Oil and Gas Blowouts (1971-78), U.S. Geological Survey Open-File Report 80-101, 15 p.

Darrow, Robert H., and others, 1981, Investigation of August 1980 Blowout and Fire, Lease OCS-G 2271, Vermilion Block 348, U.S. Geological Survey Open-File Report 81-712, 10 p.

Ford, Richard E., 1979, Well Blowout with Explosion and Fire on Board PENROD DRILLING RIG 30 at South Marsh Island Block 281, PLACID OIL CO. "C" PLATFORM, March 5, 1979, with Multiple Loss of Life and Pollution, U.S. Coast Guard

McDonald, Price, and others, 1977, An Investigation of Pennzoil's Blowout and Loss of Platform, High Island Block A-563, 31 p.

McDonald, Price, and others, 1983, Investigation of October 1982 Blowout and Fire, Eugene Island Block 361, Gulf of Mexico, U.S. Geological Survey Open-File Report 83-113, 26 p.

Sandridge, Jack C., and others, 1981, Investigation of January 1981 Blowout and Fire, Lease OCS-G 4077, High Island Block 38, U.S. Geological Survey Open-File Report 81-868, 10 p.

TABLES

Table 1. Number of blowouts on the OCS, 1979-1982.

	Drilling			Nondrilling				
Year	Exploration	Development	Total	Completion	Production	Workover	Total	Total OCS
1979	3	2	5	0	0	0	0	5
1980	3	1	4	1	1	2	4	8
1981	2	1	3	5	0	2	7	10
1982	0	4	4	1	0	3	4	8
	8	8	16	7	1	7	15	31

Information on blowouts occurring from 1971 through 1978 can be found in the U.S. Geological Survey Open-File Report 80-101 by Elmer P. Danenberger.

Table 2. OCS drilling, production, and spillage data, 1979-1982.

Year	New Wells Started	Production: Oil and Gas Condensate (million barrels)	Production: Gas (billion mcf)	Oil Spillage* During Blowouts: Exploration	Development	Completion	Production	Workover
1979	1,109	285.6	4.7	0	0	0	0	0
1980	1,079	277.4	4.6	0	0	0	1	0
1981	1,106	286.6	4.8	0	0	0	0	64
1982	1,155	321.1	4.7	0	0	0	0	0
	4,449	1,170.7	18.8	0	0	0	1	64

*Barrels of oil and oil condensate.

Tabl 3. Blowouts during exploration drilling.

Date	Location	Type Rig	Injuries and Fatalities	Pollution	Duration	Control Method	Drilling Depth Cause/Comments
01/31/79	Mustang Island A-85	semisubmersible	none	none	2 days	bridged	15,066'; hole in casing
06/01/79	West Delta 86	jack-up	none	none	5 hours	bridged	4,035'; after cementing surface casing
07/24/79	West Cameron 538	semisubmersible	none	none	19 days	bridged	5,650'; pulling out of hole
08/30/80	Sabine Pass 11	jack-up	9 injured	minor; from oil-based mud	1 hour	bridged	12,650'; pulling out of hole, derrick destroyed
08/30/80	Matagorda Island 669*	jack-up	5 dead 6 injured	none	2 days	bridged	13,794'; casing rupture below blowout preventer (BOP) stack, rig damaged
11/27/80	West Cameron 204	semisubmersible	none	none	3 days	pumped down mud	9,899'; around drive pipe

*Open-File Report 81-706

Table 3. Blowouts during exploration drilling. (Continued)

Date	Location	Type Rig	Injuries and Fatalities	Pollution	Duration	Control Method	Drilling Depth Cause/Comments
01/12/81	High Island 38*	submersible	1 dead 2 minor injuries	light sheen	1 day	bridged	11,259'; fill-up line valve left open, rig damaged
12/27/81	South Pass 54	semisubmersible	none	none	1 hour	bridged	2,731'; over-board diverter valve failed

*Open-File Report 81-868

Table 4. Blowouts during development drilling.

Date	Location	Injuries and Fatalities	Pollution	Duration	Control Method	Drilling Depth Cause/Comments
03/05/79	South Marsh Island 281*	8 dead	sheen	45 days	pumped down mud	14,615'; gate valve in mud circulation system failed, rig lost, platform damaged
04/21/79	Vermilion 25	none	light slick	18 hours	bridged	13,788'; leak below BOP system, jack-up rig lost
03/24/80	High Island A-368**	6 dead 29 injured	none	2 days	bridged	2,444'; starting logging operation
02/19/81	Ship Shoal 295	none	none	immediately shut-in	circulated mud	7,849'; well kick blew off rotary bushing

*U.S. Coast Guard Report
**Open-File Report 80-1278

The following blowout was not included in Open-File Report 80-101:

10/04/78	High Island A-551	1 dead 1 injured	none	1 day	bridged	Gas migration through microfractures in setting cement, BOP system failed, slip and seal assembly

Table 4. Blowouts during development drilling. (Continued)

Date	Location	Injuries and Fatalities	Pollution	Duration	Control Method	Drilling Depth Cause/Comments
01/07/82	South Marsh Island 131	none	none	45 minutes	bridged	900'; well came in while pulling drill pipe
05/14/82	South Timbalier 300	4 minor injuries during evacuation	none	1 hour	bridged	3,321'; kelly bushings blown out of rotary while pulling out of well
05/15/82	South Marsh Island 155	3 minor injuries while abandoning platform	none	immediately shut-in	closed blind shear rams	9,212'; well kicked, explosion and fire at the shale shaker
10/21/82	Eugene Island 361*	none	none	7 days	bridged	4,292'; annular preventer leaked after well kicked, rig lost

*Open-File Report 83-113

Table 5. Blowouts during completion operations.

Date	Location	Injuries and Fatalities	Pollution	Duration	Control Method	Cause/Comments
08/24/80	Vermilion 348*	4 minor injuries	none	30 days	relief well	Making gravel pack assemble, platform and rig damaged
01/24/81	High Island A-325	none	none	2 days	installed flange with 8-inch valve	Back-pressure valve had been removed
06/19/81	Sabine Pass 13	none	none	1 day	freezing pipe with dry ice	Pipe was backed off
07/26/81	South Pelto 18	2 injured while evacuating	sheen	6 days	closed blind shear rams	In-line safety valve would not close
10/05/81	Eugene Island 273	none	none	1 day	closed blind shear rams	Blind rams could not be closed
10/19/81	West Cameron 294	none	light sheen	1 day	closed wing valve	High-pressure joint in line broke loose
04/19/82	Galveston 391	none	none	3 hours	bridged	Well kicked while lowering scraper and mule shoe

*Open-File Report 81-712

The following blowout was not included in Open-File Report 80-101:

09/20/78	East Cameron 263	none	none	30 minutes	shut-in	Circulating line broke loose at mud pits; rig extensively damaged

Table 6. Blowouts during production operations.

Date	Location	Injuries and Fatalities	Pollution	Duration	Control Method	Cause/Comments
09/17/80	Eugene Island 215	none	slick estimated at one barrel	3 days	pumped down mud, then repaired equipment	Flow line parted during maintenance work on subsea completion

Table 7. Blowouts during workover operations.

Date	Location	Injuries and Fatalities	Pollution	Duration	Control Method	Cause/Comments
02/25/80	Galveston 144	none	none	1 day	pumped down mud	Master valve would not close, uncontrolled flow through return line while converting to injection well
03/09/80	Ship Shoal 246	none	none	1 day	pumped down mud	Two master and one subsurface valve would not close, uncontrolled flow through wing valve
02/27/81	East Cameron 46	none	none	1 day	replaced with valve	Uncontrolled flow through bull-plugged outlet on lower rams of snubbing unit
11/27/81	Viosca Knoll 900	none	64 barrels	1 day	pumped down mud	Well kicked while pulling out of hole
02/07/82	South Timbalier 176	none	light sheen	14 hours	pumped down mud	High-pressure connection to wireline lubricator broke
07/14/82	West Cameron 65	none	light sheen	57 days	bridged	Kelly cock and in-line safety valve could not be closed; jack-up rig derrick destroyed
12/17/82	West Delta 70	none	none	18 hours	closed blind shear rams	Well kicked while changing inside BOP to tubing safety valve

Table 8. Number of wells and blowouts during drilling operations.

Years	Blowouts	Wells Started	Blowouts per 1,000 Wells Started
1981-82	7	2,261	3.10
1979-80	9	2,188	4.11
1977-78	13	2,367	5.49
1975-76	9	1,934	4.65
1973-74	4	1,636	2.44
1971-72	5	1,688	2.96
1969-70	2	1,823	1.10
1967-68	5	1,863	2.68
1965-66	5	1,602	3.12
1963-64	4	1,225	3.27
1961-62	0	914	0.00
1959-60	3	681	4.41
1957-58	3	626	4.79
1956	1	387	2.58

Table 9. Number of blowouts during nondrilling operations.

Years	Completion	Production	Workover	Total
1979-82	7	1	7	15
1975-78	4	1	6	11
1971-74	0	4	2	6
1967-70	1	4	1	6
1963-66	0	5	1	6
1959-62	0	1	1	2
1956-58	0	0	0	0

Table 10. Duration of blowouts (in percent).

Years	1 Day or Less	2 to 3 Days	4 to 7 Days	More Than 7 Days
1979-82	61	19	7	13
1975-78	58	9	12	21
1971-74	40	33	7	20
1967-70	46	8	8	38
1963-66	13	13	40	34

Table 11. Fatalities and injuries during blowouts.

Years	Fatalities	Injuries
1981-82	1	11
1979-80	19	48
1977-78	1	2
1975-76	0	0
1973-74	0	3
1971-72	0	0
1969-70	4	37
1967-68	0	0
1965-66	0	0
1963-64	23	27
1961-62	0	0
1959-60	1	7
1957-58	7	17
1956	0	0

Table 12. Oil spillage (in barrels) from blowouts.

Years	Total Spillage	Largest Spill
1979-82	65	64
1975-78	0	0
1971-74	725	450
1967-70	86,000*	53,000
1963-66	6,968	5,180
1959-62	0	0

*Figure does not include amounts from the 1969 Santa Barbara oilspill offshore from California. Estimates for this spill range from 10,000 to 77,000 barrels.