STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO

23 August 1989

EXAMINER HEARING

IN THE MATTER OF:

Application of Marathon Oil Company for downhole commingling, Rio Arriba County, New Mexico. CASE 9733

BEFORE: David R. Catanach, Examiner

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Division:

For Marathon Oil Company:

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I N D E X

BRENT LOWERY

E X H I B I T S

MR. CATANACH: We'll call next Case 9733, application of Marathon Oil Company for downhole commingling, Rio Arriba County, New Mexico.

Are there appearances in this case?

MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin of the Santa Fe law firm of Kellahin, Kellahin & Aubrey, appearing in association with Mr. Larry Garcia of Marathon Oil Company.

We are here to present Case 9733 and I have one witness to be sworn.

MR. CATANACH: Any other appearances? Will the witness please stand and be sworn in?

(Witness sworn.)

BRENT LOWERY,

being called as a witness and being duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Lowery, for the record would you please state your name and occupation?

A My name is Brent Lowery and I'm a re-

servoir engineer with Marathon Oil Company in Midland.

Q Mr. Lowery, you in fact reside in Midland?

A Yes, sir, I do.

Q And have you on prior occasion testified as a reservoir engineer before this Division?

A Not as a reservoir engineer; as a production engineer, yes, I have.

Q What have you studied with regards to this application to seek approval on your Jicarilla Apache Lease to downhole commingle some Dakota production with Mesaverde Production?

A We've looked at the production records and reserve estimates for each of the zones and find some disparity between what we're currently able to produce and what the Mesaverde, in particular, is capable of producing.

Q How long have you been studying that -- that issue?

A Since about July of last year.

Q Based upon your studies do you now have recommendations for the Examiner on what to do with certain of these wells?

A Yes, sir, I do.

MR. KELLAHIN; We tender at this time Mr. Lowery as an expert petroleum engineer.

MR. CATANACH: He is so qualified?

Q Mr. Lowery, let's take your exhibit package and simply start with Exhibit Number One and show us how you have organized the wells that you're seeking approval to downhole commingle the Mesaverde and the Dakota production.

A Okay, Exhibit One, the first five wells listed with their locations and perforated intervals are wells that are currently dually completed in the Dakota and Mesaverde.

The second set of six wells are currently single Dakota producers that we propose in the future possibly to recomplete in the Mesaverde and then downhole commingle Mesaverde and Dakota production.

Q Are you seeking approval in this one order to allow you to convert the dually completed wells to wells that are downhole commingled for production of Mesaverde and Dakota, as well as a future procedure, then, that will allow you to commingle the Dakota when these other six wells are recompleted in the Mesaverde?

A Yes, we will.

Q When we turn to Exhibit Number Two what is shown on that exhibit?

A This is a list of the offset operators

of our Jicarilla Apache Lease.

Q All right, let's use Exhibit Number Three, then, and have you describe Exhibit Number Three for us.

A Exhibit Number Three is a -- is a map showing Marathon's leases and the surrounding leases for one section around Marathon's Jicarilla Apache Lease.

On the map there are several symbols over in the legend, if you'll look.

The wells that are encircled with a round circle are the current Mesaverde-Dakota dual completions.

The wells with squares around them are the proposed recompletions that we would like to downhole commingle upon completion.

And the triangles surround wells that have had downhole commingling approved already. They are dual Mesaverde-Dakota producers, also.

And also on the map the proration units for Marathon's leases are shown in the cross hatched outline in each of the sections.

Q What have you done to satisfy yourself that the downhole comingling of the Mesaverde and Dakota formation can be done without jeopardizing reserves or without violating correlative rights of any interest own-

ers?

A Well, in the requirements of Rule 303-C, I believe it is, we prepared applications and in the process of preparing those applications and gathering the necessary information we measured the bottom hole pressure in the Dakota and measured a surface pressure and determined the fluid level on the Mesaverde side of the dual completions, and come up with a reservoir pressure that way.

The pressures are almost identical; they're within a few hundred pounds of each other, in the range of plus or minus 1100 pounds, and based on that, of course, we will have cross flow but the fluids -- water is not produced in any great quantities by either formation and the fluids are -- are compatible, hydrocarbon gas and condensate.

Is the ownership common between the Dakota and the Mesaverde for each of the spacing units?

A It is.

Q I believe your plat shows us other wells by other operators for which the Division has approved commingling of Mesaverde and Dakota wells?

A Yes, sir.

Q And how are those shown?

A Those are shown with the diamond around them -- triangles, excuse me.

Q Did the Division express to you a reason why your applications for administrative approval could not be approved administratively?

A We submitted two applications, one for Jicarilla Apache 14-E, in which the Mesaverde completion never has produced in commercial quantities since the completion was made, and also for Jicarilla Apache No. 13-E, and the reason that these were not approved administratively was because the Dakota is a nonmarginal zone in this field.

Q Have you selected one of the wells as an example or a type well for which to commingle production on a test basis to see whether or not there was a benefit to the working interest owners to have that production commingled?

A The Commission granted us permission for a 30-day downhole commingling test on the Jicarilla Apache NO. 14-E Well. This well, of course, has shown the most dramatic results from downhole commingling and shows what potential may exist in the other wellbores, although we wouldn't expect such dramatic results leasewide.

Q Let's turn to that information.

MR. KELLAHIN: Mr. Catanach, it is shown by the yellow tab in your exhibit package. That will be the information, starting with Exhibit Five.

Q Mr. Lowery, before we describe your conclusions based upon Exhibit Number Five, show us what it is.

A Okay. Exhibit Number Five is a decline curve plot of that commingling test with what we would expect the Dakota to produce had it been produced by itself during the same period.

The uppermost curve on the -- on the plot there is the total gas rate produced during the test for the commingled Dakota and Mesaverde zones.

The straight line just underneath it is our projection of what the Dakota is capable of doing based on production history on that well.

The next line down represents condensate production in barrels of condensate per day produced during this test. This would be commingled Dakota and Mesaverde condensate production.

And the line at the very bottom of the plot is what the Dakota normally would produce in terms of barrels of condensate per day.

Q Have you demonstrated to your satisfaction as an engineer that the gas in the Dakota will allow you to effectively and efficiently lift the liquids in the Mesaverde and thereby extend the producing life of the Mesaverde formation in this well?

A Yes, we have. By looking at each well on the lease it is a dual Mesaverde-Dakota completion. In the process of shooting fluid levels on these Mesaverde completions we did detect a column, a fluid column, above the perforations and in the 14-E the perforations are plus or minus 5300 in the Mesaverde and we found a fluid level at approximately 1000 feet from surface, indicating approximately 4200 feet of fluid level above our perforations.

Again, this well has not been capable of producing in commercial quantities since it was completed, although on our other wells we did detect condensate accumulations in the wellbores. Those -- those Mesaverde completions do not produce condensate as a matter of natural production. Once in awhile we might get a barrel or two out of it, but by and large it produces dry gas.

Q In looking at the information available from all 11 wells, do you see any of the requirements of the administrative approval order provisions in Rule 303 that you're unable to fulfill or satisfy administratively other than the issue of the fact that you have a Dakota zone that is still commercial or a Mesaverde zone that has not yet been tested?

A (Unclear) on a cash flow basis to produce. At the present time these wells will still produce in economic and paying quantities although I'll show later

on decline curves, there, that these wells come on and produce a month -- the whole month continually, that they load up and die and, in fact, they will be come uneconomic in the very near future.

Q Can we postpone the decision to downhole commingling until some future point where both zones are uneconomic?

A The problem with waiting until the Dakota becomes uneconomic is that there we would lose our -- our mechanism to produce the fluids out of the Mesaverde that are causing the loading and the decrease in production.

The Dakota produces a much drier gas, which is much lower -- or much higher GOR than the Mesaverde, and if we wait until that gas supply is depleted and then at some time in the future artificially lift the Mesaverde, that -- that technique would not be economical because the Mesaverde reserves that are remaining wouldn't justify any great expenditure to produce them.

Q What other alternative means have you examined as an engineer to see if there was another choice, other than downhole commingling to capture these reserves?

A Most of these wells have 4-1/2 inch casing and that severely limits the options that are possible at all.

If we -- the one option there is would -- right now, would be to, you know, be able to produce both zones simultaneously and generate a return on our investment, would be to run two strings of tubing.

There's a couple of problems with that. One, the cost of the new tubing strings. We'd have to buy about 12,000 feet of tubing, small diameter tubing that's more expensive than the standard sizes. It would cost us about $80,000 to buy the tubing and then install it.

Also, physically in that area this gas does produce a small amount of CO_2, enough to cause corrosion damage to higher strength tubulars that would be required to run to a depth of 7200 feet, which is where our Dakota perforations are.

J-55 physically is not capable of being run that deep and especially not in the dual completion situation where you have packers and that sort of thing that would be required to isolate the zones.

And also, for the amount of reserves we're talking about potentially recovering, I ran the economics with the 100-million remaining in reserves, where in reality we're looking at more on the order of 50-million per well for the wells we're talking about. At current gas prices we'd never see a positive cash flow from that investment.

Q Does downhole commingling, then, represent the best and most viable alternative for -- for ultimate recovery of production from both of the formations?

A It's certainly the most viable one; probably the only choice now or at any time in the future.

Q Have you attempted to quantify the additional reserves that you might not otherwise recover if the Commission does not approve the downhole commingling?

A Yes, I have. In the attachments marked Exhibit Five, the second and third sheets are a xeroxed copy of some information out of Dwight's. It's P/z and rate/cum data and there also is shown on there cumulative production.

Using accepted techniques of P/z analysis on, in particular, the Jicarilla Apache No. 9-E, we show an ultimate recovery of about 205-million cubic feet of gas and I'd like to point out for our discussion here that in the last quarter, last half of 1987 Northwest Pipeline in- advertently reported to Marathon in the five dual completion wells, they inadvertently reported Dakota production as Mesaverde production. They got the meter numbers switched somehow, but the cumulative production on those wells as shown in these plots is different. It's lower, in particular on the No. 9-E, the cumulative production on that is about 154-million as opposed to the

almost 169-million shown on the plot.

The ultimate recovery based on the P/z analysis is about 205-million cubic feet. That well has produced about 154-million cubic feet, which leaves us about 50-million cubic feet remaining to be recovered.

The last --

Q Just so I'm clear on the 9-E Well, what portion of that gas production ultimately would not be recovered if the downhole commingling of the Dakota and the Mesaverde was not approved?

A Okay. If you'd like to look at the last page in that document, it's a decline curve showing the past -- past four months, we've gotten a settlement out of Northwest Pipeline. We're now able to move that gas and even with a marginal well we're able to produce that well for the entire month for each month we have a contract for the gas.

There's a line drawn through the last four months of production and up in the upper righthand corner there's a decline rate calculation, and the remaining reserves projected based on this decline is about 9-million cubic feet. So the amount of gas in jeopardy in this particular case is about -- it comes out to be about 49-million cubic feet, 41-million cubic feet in jeopardy.

And a similar analysis was done for the

Jicarilla Apache No. 16-E.

Q That will be the next -- the next P/z plot after the 9-E is the 16-E?

A Right.

Q All right, and you've shown ultimate recovery on your decline of 120 --

A Right.

Q -- MMCF?

A And the cumulative production on this well is actually 64,600,000 as opposed to the 95-million shown by Dwight's.

Q Okay, and on your decline curve for the 16-E, what do you show for the remaining recoverable?

A We show about a million cubic feet remaining recoverable.

Q So that puts at risk some 63-million?

A Right, that's correct.

Q In the event downhole commingling is not approved.

A That's correct.

Q In your opinion is the information derived from analysis of Well 16-E and the 9-E Well, is that going to be typical or characteristic of the other wells that you're seeking downhole commingling approval for?

A Yes, it is. It's characteristic of

those and also characteristic of the offsets that have had downhole commingling approved for them.

Q How would you propose the Division Examiner set up a percentage for allocating production between the Dakota and the Mesaverde?

A This was -- has been done in what's marked Exhibit Four. Those are the five applications for our five existing wells and the percentage lists were determined based on previous Mesaverde and Dakota production.

Q From that well?

A From -- from each of the individual wells.

Q And we're talking about the five that are already dualed wells.

A Right.

Q So you've taken --

A These were based on the two completions in each of those wells, so each -- each split is unique to each wellbore.

Q How would you propose a method for allocating production for the other six wells for which you have not tested or completed in the Mesaverde?

A I would propose that we be allowed to complete and test the Mesaverde and see what kind of pro-

duction we'd be able to get from that and then determine our split at that point.

But, you know, if -- if we had to have the percentage split before that information was available, I would -- I would recommend we take an average of the five wells that are completed and use that split.

Q There is no unusual expense or difficulty for Marathon as the operator to individually test the Mesaverde formation before you commingle it with the existing Dakota production?

A During the process of completion we would do that, anyway, so that poses no hardship.

Q Was the information shown in Exhibits One through Five either prepared by you directly or compiled under your direction and supervision, or represent documents available from the files of Marathon or the Oil Conservation Division?

A Yes, they are.

Q And to the best of your knowledge is the information shown true and accurate?

A Yes, sir, it is.

MR. KELLAHIN: We move the introduction of Exhibits One through Five.

MR. CATANACH: Exhibits One through Five will be admitted as evidence.

MR. KELLAHIN: That concludes our examination of Mr. Lowery.

CROSS EXAMINATION

BY MR. CATANACH:

Q Mr. Lowery, do each of these separate applications have all the required information needed to process these --

A Yes, sir, they do, with the exception of, I believe, the last three. I don't believe we got a map attached, but Exhibit Three should suffice for that.

Q Is Marathon the only working interest owner on the Jicarilla Apache Lease?

A Yes, sir, we are.

Q Do you know which of these wells is currently nonmarginal in the Dakota formation?

A All five --

Q All five of them are?

A -- of them are nonmarginal in the Dakota.

Q Have you got production -- some production tests on that?

A Yes, sir, there's a decline curve for each completion attached to each of the applications.

Q Are all of these five wells considered

marginal in the Mesaverde?

A With the exception of No. 8-E. No. 8-E is also nonmarginal in the Mesaverde.

We do have evidence that, you know, by means of the fluid level surveys, that we do -- are getting an accumulation of fluid in that wellbore, as well. While the production now is nonmarginal, we anticipate sometime in the near future that it will become marginal.

Q You've got fluid accumulation in all five of your wellbores?

A Yes, sir, we do.

Q All right. Both these are prorated gas pools. Do you know what the status of the -- well, what I want is do you know if there is any under or over production in any of these zones currently?

A Currently the Dakota is overproduced.

Q Which wells?

A In all five, I believe. I'm not sure, with the exception of No. 9-E what -- how much overproduced they are, but I know No. 9-E would produce about 3 days a month because it's right at the 12 times overproduced limit.

Our problem there, of course, is with, you know, take or pay problems with Northwest and they had it shut in for quite some time and we just haven't been

able to generate a great deal of allowable and now that we're able to produce, they reach their overproduced status pretty quickly.

Q What's going to happen if -- if you have to shut the well in? It's downhole commingled and you have to shut the well in due to overproduction? Is that going to cause any loss of reserves?

A That's not going to cause any loss of reserves. It will just, you know, one pool's going to limit the production from the other but ultimately it will -- at some period in the future that over -- overproduction status in the -- should -- it should come into balance where they'll be both overproduced in the same amount or underproduced, or whatever the case may be in the future.

That -- I'd like to mention that that shouldn't cause any loss of reserves. It will just be an inconvenience for Marathon to schedule production from those wells.

Q The six other wells that are -- that are not currently dually completed, those are all Dakota producers, are they not?

A Yes, sir, they are.

Q Are those, all of those nonmarginal in the Dakota?

A I'm not for certain about all of them

but I'm pretty sure that they are all nonmarginal.

I would have to check.

Q Is the fluid accumulation problem something that gets worse over time as you produce these wells, as the pressure depletes?

A That's right. As the pressure depletes and you get less rate through that annular -- annular completion, you lose the ability to -- well, your ability to move liquids up that annulus decreases.

Q The six proposed Mesaverde completions, do you anticipate that you'll have that problem right off, right when you complete it?

A To some extent we should. You know, for instance, the 14-E has had that problem from the very start and the other -- the others, with the exception of Number 8-E, have also had -- had varying degrees of liquid loading, you know, ever since they were completed.

If you look back on the production curves you can see that cycle. When they come on they fall off pretty quick and then they'll be shut in for a period and come back at a higher rate and then again log off.

Q Uh-huh.

A The problem that we have out here is the Mesaverde is shallower so it has to be produce up the casing/tubing annulus, which has a cross sectional area

that's several times greater than if it were allowed to produce up the tubing. There's just not enough gas velocity to move the -- move the liquids, and the Mesaverde does make quite a bit of liquid.

Q You did a calculation that you'd lose, you might lose some reserves in the 9-E and 16-E. Did you do that on all the other wells, or just those two?

A Just those two but a similar situation would apply to the rest of them.

Q Now, how would you propose to allocate production when you open up the Mesaverde in those six additional wells?

A We would make a production test upon completion in the Mesaverde and probably produce it by itself for, hopefully, a period of several months, and determine how it's going to perform and then base the production split on that test on the Mesaverde with production history from the Dakota and come up with an allocation that way.

Q So you would test that for a period of time before you actually commingled?

A Right.

Q Your allocation formulas in your five existing dually completed wells, is that based on production history?

A Right, it is, with the exception of the

14-E.

Q Which is based on -- which is based on what?

A If I could have just a minute to look at the application?

The allocation for the No. 14-E was based on that 30-day commingling test.

Q That -- was that the well that the Mesaverde was not produced at all?

A That's correct. And that 30-day test is the only real information that we had, or data we had, to base our production split.

Q So the only increase that you got in that test, you just allocated to the Mesaverde.

A That's correct.

Q What about the condensate produced from those two zones, would it be in the same proportion as the gas?

A No, it wouldn't.

Q Is there a --

A That's one item we didn't address in the application and it's an oversight on our part.

Q So we don't have any information on what to allocate the liquids?

A Well, based on the test, it looks like

90 percent of the condensate, roughly, should be attributed to the Mesaverde and the remaining 10 percent to the Dakota.

Q That's on the 14.

A Right.

Q Should that apply in all the other wells?

A In the other wells it should be similar to -- to what the Dakota produces, but there again, we have no condensate production on the Mesaverde completion, so we have nothing to compare it with, because the Mesaverde won't unload the condensate, which is the cause of our problems.

Q Go over that again for me. 90 percent to the Mesaverde for the liquids and 10 percent to the Dakota.

MR. CATANACH: I think that's all I have of the witness.

MR. KELLAHIN: Mr. Examiner, we have as an Exhibit Six the notification to the offset operators. While the certified mailings were sent to all of them, I have come over here without the last two cards, so I'd like to give you a copy of Exhibit Six and then tomorrow bring over the completed returns. I have not brought with me the last two cards which we've received

back, so I need to give you the cards for Southern Union Exploration and Meridian Oil, Inc., which we've received, and I simply neglected to bring with me.

MR. CATANACH: Okay. We'll admit Exhibit Number Six in that case.

Is there anything further in Case 9733?

MR. KELLAHIN: No, sir.

MR. CATANACH: It will be taken under advisement.

(Hearing concluded.)

C E R T I F I C A T E

I, SALLY W. BOYD, C. S. R. DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division (Commission) was reported by me; that the said transcript is a full, true and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd CSR

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 9733, heard by me on August 23 1989.

David R. Catanach, Examiner
Oil Conservation Division