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I N D E X

RAY NOKES

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2 MR. STAMETS: We'll call next Case
3 7875, being application of Harvey E. Yates Company for ter-
4 tiary oil recovery project, Eddy County, New Mexico.

5 Call for appearances.

6 MR. HALL: Mr. Examiner, I'm Joe Hall
7 with Harvey E. Yates Company, representing the applicant, and
8 I have one witness.

9
10 (Witness sworn.)

11
12 RAY NOKES,

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

15
16 DIRECT EXAMINATION

17 BY MR. HALL:

18 Q Would you state your name and address,
19 please, sir?

20 A Ray Nokes. I live in Roswell, New Mexico.

21 Q And what is your position with the appli-
22 cant, Harvey E. Yates Company?

23 A Reservoir Engineer.

24 Q And have you testified before the Division
25 before and have your qualifications as an expert petroleum

1
2 engineer been accepted?

3 A. Yes, sir.

4 MR. HALL: Mr. Examiner, I'd request
5 that Mr. Nokes be recognized as a qualified expert petroleum
6 engineer.

7 MR. STAMETS: He is considered quali-
8 fied.

9 Q. Mr. Nokes, are you familiar with the appli-
10 cation filed in Case 7875?

11 A. Yes, sir.

12 Q. Would you please state what the purpose of
13 the case is?

14 A. We are seeking the authority to convert
15 the Travis Penn Unit to a polymer augmented flood pursuant to
16 Section 4993 of the Internal Revenue Code. We are seeking
17 the certification of the project as a qualified tertiary oil
18 recovery project.

19 Q. And where is the Travis Penn Unit located?

20 A. Township 18 South, Range 28 East, of Sec-
21 tion 12, the south half of the southeast quarter; Section 13,
22 north half and the north half of the southwest quarter of
23 Eddy County, New Mexico.

24 Q. And who is the operator of the Travis Penn
25 Unit?

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A. Harvey E. Yates Company.

Q. Has the Oil Conservation Division previously approved the Travis Penn Unit as a secondary recovery unit?

A. Yes, sir. The Travis Penn Unit was initially approved as a secondary recovery project by the Oil Commission's Order No. R-6765, of August the 28th, 1981.

Q. If you'd please refer to Applicant's Exhibit Number One, identify it, and explain what it is for the Examiner.

A. This is a result and the approval of said order, the order date, and it was included in here for the Commission's benefit so they wouldn't have to go back and look it up.

Q. Well, would you please identify what Exhibit Number One is?

A. Okay, it is a copy of Mr. Ramey's letter to Harvey E. Yates with the respective order attached, R-6765, indicating that it is approved as a waterflood.

Q. And if you'll please refer now to Applicant's Exhibits Two-A and Two-B and explain what they are for the Examiner.

A. Exhibit Two-A is Order WFX-499, which was the result of Exhibit Two-B, Application for Expansion of the Travis Penn Unit, this date of May the 10th, 1982, was

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2 given permission for an expansion by the Commission.

3 Q Referring now to the tertiary recovery
4 project that we are presenting here today, what is the method
5 of tertiary recovery proposed to be used?

6 A Method is a polymer augmented waterflood.

7 Q Do you anticipate that this polymer aug-
8 mented waterflood will result in more than an insignificant
9 increase in the ultimate recovery of crude oil from the Travis
10 Penn Unit?

11 A Yes, sir.

12 MR. HALL: Mr. Examiner, at this point
13 we'll begin a description of the process we propose to use
14 in the project.

15 Q If you'd refer, Mr. Nokes, to Exhibit
16 Number Three, identify it, and tell the Examiner what it
17 shows.

18 A This is a completion schedule that we use
19 giving history of the well as far as casing, tops, the loca-
20 tion, and if I may direct you to the recommended procedure,
21 which is about middle way down the exhibit -- the first page
22 of Exhibit Three, this is the initial procedure that we will
23 use to treat the well with a polymer, which will be initiated
24 as a very thin viscosity fluid with a setting factor that
25 will occur within about two to four days, resulting in an

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approximately 100 -- or about 100,000 to a million centi-
poise viscosity.

Attached behind it is the cost of said
procedure.

Q Okay. If you'd also now refer to Applicant's
Exhibits Number Ten and Eleven, and, Mr. Examiner, those are
the maps that are at the end of the -- if you would explain
to the Examiner what these exhibits consist of, what they
show, and the purpose behind this -- this polymer augmented
waterflood, why we want to -- to institute it.

A These really need to be looked at together.
The cross section has been drawn to include -- this was the
original cross section that we had.

Q If you will identify for the Examiner and
Mrs. Boyd which exhibit is the cross section --

A Okay.

Q -- and which exhibit is the structure map.

A Exhibit Eleven is the cross section. Ex-
hibit Ten is the structure map with the larger numbers by the
wells indicating the tops of the permeability in the Canyon.

Also the permeability was added to our
original cross section in the Exhibit Eleven. It shows
structure relationship between our injectors and the offset
producers.

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2 If I may, Exhibit Ten, the well in the
3 center or just southwest of the center of Section 13, there's
4 a number indicated as a -6215, being the northeast quarter
5 of the southwest quarter of Section 13. This is our injection
6 well, being lower on structure we are flooding in it to the
7 northeast sweep, structural sweep.

8 The problem that has occurred is that the
9 well just due north of this, having a structure relief of --
10 or permeability relief of 62 -- 16206 subsea, we had a break-
11 through in approximately four months a very slight increase
12 in water production and it continued so until this point now,
13 which is about a 93 percent water cut.

14 About a month following the well just to
15 the east of it, which is the Penn 3, Travis Penn No. 3, at
16 a -6191, also had a same occurrence but at a slower rate.

17 Both of these wells have indicated by the
18 flooding that has occurred that we do have higher permeable
19 zones. The purpose of this is -- this treatment is to occlude
20 the higher permeable zones and to get a more uniform vertical
21 flood.

22 The process will shut off or seal off to a
23 certain period of time, we're not sure, but it's estimated
24 at two to five years, with the dissipation of the polymer,
25 but it will redirect the flood to flood the lower permeable

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2 zones in the formation. These zones are not identified due
3 to the fact we do not have cores, but we have estimated that
4 permeability range is anywhere from 109 millidarcies to 100
5 millidarcies, average permeability being in the neighborhood
6 in the majority of the formation of 1.71 millidarcies.

7 Q Do you have anything further to add on Ex-
8 hibits Three, Ten, or Eleven at this time?

9 A No.

10 Q All right. If you would refer now to Ex-
11 hibit Number Four and describe that for the Examiner, please.

12 A Exhibit Number Four is a Travis Penn Unit
13 plat indicating -- I'll have to apologize, this is indicated
14 as the Travis Penn but it still has the old Travis Deep Unit
15 numbers which were not changed after the Commission's re-
16 quest after it being unitized.

17 The Travis State Com No. 1, which is the
18 lower well in the unit presently known as the Travis Penn
19 Unit No. 5, is our injector. The outline hatched marks indi-
20 cate the unit and this is the area that we are concerned in
21 in this hearing.

22 Q All right, this -- this whole Travis Penn
23 area would be the area from which you expect the ultimate
24 recovery of crude oil to be increased as a result of the
25 project?

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2 A. Yes, sir, it's some 1505 acres under the
3 unit.

4 Q. Let's turn now to a discussion of the in-
5 crease in the amount of crude oil to be expected as a result
6 of the flood.

7 If you would refer to applicant's Exhibits
8 Five, Six, and Seven, go through them explaining what they
9 show and what the purpose of entering them is.

10 A. The purpose of these exhibits are to give
11 a number of different ways of looking at production under the
12 unit.

13 Exhibit Number Five is a well-by-well pro-
14 duction history based on monthly production, indicating the
15 production as well as cums for gas, oil, and water. It
16 wasn't until August that we come to pumping the wells our-
17 selves and getting correct water production so at that time
18 we did start getting some water production indicated.

19 This is for each well. The front sheet
20 starts out with the Travis Penn Unit One, going through the
21 Travis Penn Unit No. 6, which is the last sheet under Exhibit
22 Number Five.

23 Exhibit Number Six is a monthly production
24 comprised of the wells and to the right of each date indi-
25 cates the number of wells that were producing and, if I may,

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2 after July it should be understood that our well was injecting,
3 the Travis Penn Unit No. 5 was injecting at this time, so it
4 was not included as a producer.

5 It indicates the relative production and
6 the decline that's occurred, and if you will notice along in
7 October it continues to climb, indicating that we are having
8 a considerable amount of water increase, as it does indicate
9 in the fifth column over, barrels of water produced.

10 Attached to it is a graphical display of
11 how the production has gone since January of '82.

12 Exhibit Number Seven, this is a printout of
13 each well by month, taken from C-115's and calculated on a
14 daily rate. If you will notice, in October of 1982 the Travis
15 Penn Unit No. 4, being the third column -- or it would be the
16 fifth column over under 10-82, the production of 30 barrels
17 of oil, 92 Mcf, and 50 water. This continued to increase
18 until, as the second page will indicate, in March of about
19 64 barrels. There again our production decreased as our water
20 increased, indicating that we were -- our vertical conformity
21 of flood was not efficient and it was taking the path of
22 least resistance, flooding our higher permeable zones.

23 Also, the Travis Penn Unit No. 3, approxi-
24 mately one month later, November of '82, beginning to increase
25 in water production there, also.

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2 At the present, if I may, it's about 93 to
3 95 percent water cut.

4 Q All right, if you would now refer to appli-
5 cant's Exhibit Eight and explain what that shows, please.

6 A This is a polymer printout, indicating the
7 parameters that it was calculated off of, the material balance
8 of oil in place under the unit. The second section, which is
9 indicated as waterflood calculations current, this is what it
10 would be projected under certain circumstances of water cut
11 being 95 percent till the end of the life of the well, or the
12 life of the unit.

13 At the economic limit it's projected that
14 there would only be a cumulative production of 563,596 barrels
15 total.

16 What we hope to accomplish by flooding would
17 be the next column down, being a viscosity of the displacing
18 fluid, indicating a centipoise of one centipoise. We are
19 trying to do two things. One is the initial treatment to seal
20 off the higher permeable zones and flood it more uniformly.
21 If this is not successful within possibly four to six months
22 seeing some kind of a definite decline in water production,
23 it's our plans to implement a polymer -- continuous polymer
24 flooding project. It's still relatively the same effect as
25 the initial but it would actually flood with a one centipoise

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2 viscosity fluid to flood all permeable zones.

3 Q Would you also be asking the Examiner to
4 approve a continuous polymer --

5 A Yes, not only --

6 Q -- at this hearing, not only an initial?

7 A Correct. We'd ask approval for the initial
8 K-trol treatment, which is the initial treatment to shut off
9 our higher permeable zones and try to flood our lower permeable
10 zones, and if this is not successful, then we are requesting
11 that a continual polymer augmented flood be approved so that
12 we could pursue that and get a uniform vertical and horizon-
13 tal efficiency flood.

14 Q All right, Mr. Nokes, I'd like you now,
15 still referring to Exhibit Eight, to discuss the estimated
16 crude oil reserves within the project area.

17 A Material balance indicated that under the
18 initial application of 11,909,300 barrels under the unit of
19 1505 acres. At present, if you will notice on the next to the
20 last line of the first section, cumulative production in bar-
21 rels of oil and Mcf, we have to date, that would be the first
22 of March, 433,969 barrels and 894,041 Mcf.

23 The result that we are achieving as this
24 waterflood progresses would be the third section of informa-
25 tion down, next to the last line, recoverable oil from present

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2 to 95 percent water cut would be 1,358,314 barrels.

3 Q Now that is with the polymer, is it not?

4 A Yes, that's correct. That would be with
5 the polymer.

6 Q What would be the expected recovery if the
7 polymer project is not implemented?

8 A The 500 -- projected 563,000. I would like
9 to explain that on the next page we have a comparison of our
10 under Exhibit Number Nine we have a comparison of the production
11 versus income. There again there are additional -- if I may
12 take just a second, there are additional programs indicated
13 here for different viscosities. We are going -- our initial
14 continuous polymer flood, we would achieve a one centipoise
15 viscosity and increase as the situation occurs that we may not
16 be getting the response we would like to, but economics indi-
17 cate that a one centipoise viscosity would flood uniformly and
18 be most desirable as far as the economics ends are concerned.

19 Q So you've -- you've testified that you ex-
20 pect to recover 1,358,314 barrels with the polymer, 563,596
21 barrels without the polymer, is that correct?

22 A Correct.

23 Q So you're expecting to increase the recovery
24 of crude oil as a result of this project by an additional
25 794,718 barrels, approximately.

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A. Yes, sir.

Q. Okay. On what date would you be able to begin the injection of the polymer?

A. We have been waiting for this hearing to be approved or to take place and approval be granted. As soon as approval is granted we will initiate steps to start the polymer treatment.

Q. Probably be sometime in 1983?

A. Yes, sir, probably in the next month if it's approved.

Q. All right, let's turn now to the expected -- a little bit more in the expected duration and number and frequencies of the injections.

Turnign back to Exhibit Three here, if I can find it, I think you have already testified on this briefly, but I have -- your Exhibit Three only refers to the initial --

A. Polymer treatment.

Q. -- polymer treatment as -- as I recall, is that not correct?

A. Yes, sir. If you'll notice, Line 16 of that initial treatment indicated that we were currently under evaluation up until last week, trying to get a computer program that would give us some calculated values, theoretical

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2 values that were in the ballpark. Halliburton Services out
3 of Duncan, Oklahoma, was working with us on this so that we
4 could extrapolate a volume of polymer and a concentration of
5 polymer in the continuous polymer augmented flood. At that
6 time, which, of date March 24th, '83, this information was not
7 known so it was not included on that exhibit.

8 Q. Would you be able to make that available to
9 the Examiner if -- if he wants the information?

10 A. Yes, what it amounts to is a 350 to 400
11 parts per million polymer augmented flood; which amounts to
12 about 94 pounds of polymer a day injected through a positive
13 displacement pump, either duplex or triplex pump.

14 Q. If you'll refer now, briefly, back to Exhi-
15 bit Four, the land plat, how many wells are currently in the
16 project area?

17 A. There are currently six total wells. Of
18 those six wells there are five producers and one injector.

19 Q. At this time and under the proposed project
20 you're presenting here today, do you expect to drill any ad-
21 ditional wells or to converting other producing wells to in-
22 jection wells?

23 A. No, sir, not at this time.

24 Q. All right, if you'd refer now to Exhibit
25 Nine, which you mentioned briefly, previously, would you ex-

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plain what that exhibit shows, please, sir?

A. Exhibit Nine is an economics prepared based on current expenditures for monthly operating expense and monthly income, based on the production volumes of March. The current operating expenses indicated a little over \$3000. The oil production at that time was continuing to fall off but based on that, we based it on that rate at which we had had our production from the OCD on C-115's.

The estimated productive life of the unit, based on the waterflood efficiency is twelve years.

The estimated recovery to economic limit under the current situation -- or current waterflood, water -- the water we are injecting based on a .55 centipoise viscosity, would yield an additional from today's cumulative production, 129,627 barrels of oil, and 195,226 barrels of oil.

The expected response of the waterflood to economic limit would yield 924,345 barrels of oil from today's present cumulative production; 1,392,119 Mcf additional gas.

The "A" column or the "A" coincide with each other either water or "B" being the polymer treatment, based on a 12-year operating expense we're looking at close to half a million dollars operating expense under current conditions and over a 12-year period before taxes approximately 4,800,000 dollars income, based on current dollar value. No appreciation,

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2 no interest was figured. It was based strictly on straight
3 scale of what our income is today.

4 The overall benefit of the flood, if you
5 will notice, being the gross profit before Federal income tax
6 would be \$27,656,790. I might indicate that under Section B
7 it does give the polymer ratio and the cost indicated for the
8 polymer and the rentals on the pumps, being close to \$7-million
9 over the twelve year period.

10 Q. So you have determined that it would be
11 economically beneficial to carry out this project?

12 A. Yes, sir, it would.

13 Q. Is it your opinion that the granting of
14 this application will prevent waste, protect correlative
15 rights, and prevent the drilling of unnecessary wells?

16 A. Yes, sir.

17 Q. Were Exhibits One through Eleven prepared
18 by you or under your direction and control?

19 A. Yes, sir.

20 MR. HALL: Mr. Examiner, that's the --
21 that concludes my direct questioning.

22 I'd simply like to reiterate that we're
23 asking here not only for the Division to approve our hearing
24 on the polymer project but also to receive the certification
25 that -- as a tertiary recovery project for the IRS.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Nokes, are Exhibits Eight and Nine based upon -- on the one-shot polymer injection that you've shown on Exhibit Three, or are they based on a continuing polymer injection?

A That's based on a combination of both, Mr. Stamets. The initial treatment, if I may explain this, is a dissipating polymer treatment; within three to five years the polymer tends to start breaking down as a result of the shearing effect from the waterflood.

As it does this, the concentration of polymer that is carried along with the waterflood acts as a polymer flood. The treatment is normally suggested by the service companies to be reimplemmented approximately every four years to continue sealing off the higher permeable zones so that you can continue to flood vertically and have a uniform areal extent.

The purpose of the request was to take care of both possibilities. Our, like I say, our primary implementation would be the K-trol treatment to seal off the higher permeable zones, at which time it should be within

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2 probably two to four months, we should see a definite effect.
3 We may or may not introduce the polymer, continual polymer
4 flood, but at the same time as this dissipates, it will be
5 flooding, fingering through the -- the higher permeable zones
6 that were initially open. It will be flooding with a higher
7 viscosity fluid than the .55 centipoise waterflood that was
8 initially introduced.

9 So you have a continual polymer flood from
10 the time you introduce the K-trol treatment. It's just we're
11 requesting so that we will not have to have an additional
12 hearing to get approval for both and have the option to flood
13 with a polymer at that time. The expected outcome is the
14 same either way.

15 Q Do you have an Exhibit Nine which would
16 reflect the cost of the one-shot treatment?

17 A Yes, sir, that -- it's not the Exhibit Nine.
18 It is attached to -- it's the second page of Exhibit Three.
19 The proposed treatment is \$21,491. Also, under Exhibit Nine,
20 under the second section, Part B, the third row down it says
21 with the initial K-trol treatment of \$20,491, that being a
22 typographical error. It's added right but there's a typo-
23 graphical error. That should be \$21,000. That was included
24 in the economics but the actual AFE that was sent to partners
25 is attached to Exhibit Three for the initial treatment.

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2 Q Your lawyer may be able to answer this
3 question. Have you all looked at the requirements for the
4 windfall profits tax to determine whether or not this one-shot
5 treatment would qualify the project for an exception?

6 MR. HALL: If, Mr. Examiner, if -- if
7 the project involved a single injection we are to -- we are
8 supposed to give you an estimate of the period of time during
9 which the injectant will continue to increase the recovery of
10 crude oil and it was my understanding that we are asking for
11 basically a continuing flood here, so I didn't incorporate
12 that into my -- into my questions.

13 A If I may, this has been approved, the K-trol
14 treatment has been approved. This is hearsay, I'm not direct,
15 but through Pennzoil, if I remember correctly, has a pilot
16 program over in Brownfield, Texas, that was treated with K-
17 trol treatment. They self-certified themselves, Texas being,
18 I think, a little bit different than it is here in New Mexico.
19 They self-certified themselves, undertook the project, and
20 then after they had the responses went to the IRS for their
21 approval.

22 But the polymer treatment, irregardless, is
23 a polymer augmented flood. It does -- it is a classified
24 tertiary recovery treatment as the IRS has stipulated under
25 their requirements, being a polymer augmented flood.

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2 MR. STAMETS: I just have a little dif-
3 ficulty with -- with trying to compare a \$21,000 treatment
4 with a \$6-1/2 million operating expense if the project is on
5 a continuous basis, and I really don't feel very confident
6 that what I've been given here tells me what -- what the ex-
7 pected effect may be if the one-shot treatment is what is ac-
8 tually done.

9 A. Well --

10 MR. STAMETS: As far as recovery.

11 A. Recovery, as such, like I said, is going to
12 be a determining factor of the polymer effect. If we are
13 able to seal off the higher permeable zones we anticipate
14 being able to flood uniformly the lower zones. As the poly-
15 mer dissipates in the higher permeable zones, it will, like I
16 say, have a polymer flooding effect, well, actually from day
17 one from what the service companies indicate to us because
18 of the shearing effect, but if it is not the response that we
19 would like to see, if it does not respond, not knowing what
20 the structural conformity is away from the wellbore, we are
21 planning on implementing the -- the continuous polymer treat-
22 ment at our injection plant.

23 MR. HALL: I think what the Examiner
24 is trying to determine, Mr. Nokes, is whether you are expecting
25 to make just one single injection or whether you are asking

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2 to have -- be authorized to make multiple injections.

3 MR. STAMETS: No, no, that's not what
4 I'm --

5 MR. HALL: Is that --

6 MR. STAMETS: No, let's just hold it
7 a second while I confer with my legal counsel.

8 (There followed a discussion
9 off the record.)

10 MR. STAMETS: Based on what I had
11 understood the witness to say, I was under the impression that
12 if the one-shot polymer injection did work to stop this break-
13 through which was being seen, that then the continuous twelve-
14 year polymer injection would not occur. Am I wrong in that
15 assumption?

16 MR. HALL: That was the way I was in-
17 terpreting it, too, Mr. Examiner.

18 A. I apologize if I confused you. The three
19 to four months that I mentioned there, Mr. Stamets, was to
20 let us determine whether our initial treatment shut off those
21 higher permeable zones.

22 If we tried to do a polymer treatment right
23 now under the continuous polymer augmented flood, we would
24 have very little effect because of the tremendous permeability
25 we have that we calculated in the well.

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2 The initial treatment is to try to seal off
3 the higher permeable zones that are flooding so rapidly. In
4 doing this we will watch it probably for two to four months to
5 see if we get that response. If not, we will probably repeat
6 a K-trol treatment to try to shut that off.

7 Then once we have determined that we have
8 sealed off the high permeable zones, we will introduce the
9 continuous polymer augmented flood.

10 I apologize if I confused you. Putting the
11 three to four month span of observation may have been what
12 confused the issue.

13 MR. STAMETS: Okay, that -- that does
14 help clarify the issue.

15
16 QUESTIONS BY MR. QUINTANA:

17 Q Should this polymer not shut off the high
18 permeable zones, will you continue -- go ahead and continue
19 this injection?

20 A At that time we would probably introduce a
21 permanent sealant into the wellbore calculated on viscosity
22 and pressure rate, try to seal it off, then start the polymer
23 augmented flood. We've got to -- we've got to seal off the
24 problem we've got right now before we introduce the polymer
25 or we'd be wasting thousands of dollars.

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2 Q The reason the I bring that up is because,
3 you know, we're here to -- you ask to be certified for the
4 IRS reasons as a certified polymer flood, and I bring up the
5 question, you don't know if it is going to work, and if it
6 doesn't work, you claim that you're going to institute physi-
7 cal closing off of those zones which in reality would not, you
8 would not continue with the tertiary recovery, your tertiary
9 recovery would have ended.

10 A No, we'll continue to --

11 Q Oh, you will?

12 A We will, yes.

13 No, we've got -- it's sort of like having
14 a 2-inch hole and a 1-inch hole. You've got to plug the
15 larger hole before you can flood through the lower one. If
16 you don't do that it's going to take the path of least resis-
17 tance. It's going to flood the higher permeable zones and
18 you'll never flood your pay zones that are of lower permeabi-
19 lity.

20 Q So you're going to combine physical with
21 polymer conformance.

22 A Right now we are going for the chemical
23 treatment to physically shut off the higher permeable zones.
24 The compound will solidify into a jelled form in the matrix
25 and this will divert it to other lower permeable zones and

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2 thus initiate a flooding effect. At that time we will ini-
3 tiate either purchasing or renting the equipment and start
4 injecting polymer.

5 Q. One last question. I take it, then, that
6 every so often, once you determine what your components for
7 the wellbore are, you will inject additional polymers, hoping
8 to seal off different water zones.

9 A. Correct. If it, like I say, by plotting,
10 from what we've been able -- from what I have seen from the
11 service company's information given to them by the companies
12 that they have been doing treatments for, it looked like about
13 two to three years is more so in the dissipation of the
14 higher permeable zones that were shut off. At that point in
15 time a smaller treatment but a treatment would have to be
16 introduced to seal off that zone of higher permeability and
17 get the waterflood back into a true vertical conformance ef-
18 ficiency so it would flood uniformly.

19 Q. Okay, will the cost of implementing -- put-
20 ting in this polymer be approximately the same cost each
21 time, for example, \$21,000, like every thirty years, will that
22 be the cost?

23 A. Basically --

24 Q. Or give or take inflation --

25 A. Well, there again, all of this is based on

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2 current costs. Inflation, it's naturally going to go up. I
3 would say the time period that the well would be down would
4 offset to a certain degree the cost of the treatment because
5 you're going to have an on-going daily cost which accumulates
6 to nearly \$7-million over a twelve year life. The time period
7 it's down due to treatment is going to be offset by the poly-
8 mer that was not continually injected each day.

9 Q. Thank you.

10 MR. HALL: If I may ask one further
11 question that I -- that I missed going through.

12
13 REDIRECT EXAMINATION

14 BY MR. HALL:

15 Q. Would you please state what Harvey E.
16 Yates Company's employer identification number is?

17 A. Yes, sir, it's 85-0207478.

18 Q. Thank you.

19
20 RECROSS EXAMINATION

21 BY MR. STAMETS:

22 Q. Mr. Nokes, what polymer will be used during
23 the continuous injection phase?

24 A. It's polysaccharide, from what I have
25 been given by the service companies. Now the initial is a

1
2 monomer (sic) polymer that once it sets up, it will be similar
3 to a polysaccharide or a polysaccharide derivative, which is
4 a -- all that means is just a multichain compound, which would
5 restrict the flow of water.

6 Q Now, on Exhibit Three it says, under 16,
7 the polymer additive is under evaluation.

8 A Yes, sir.

9 Q Now, I presume the intention, then, is to
10 add whatever volume of this is necessary to achieve this one
11 centipoise viscosity fluid for injection.

12 A Okay. If I might, under Exhibit Number Nine,
13 there again, when this Exhibit Three was prepared we did not
14 know what viscosity would be most economical.

15 Q Okay.

16 A Under Exhibit Nine, under the last section
17 there, Part B, the twelve year operating expense based on the
18 current, plus a 350 to 400 part per million would give you
19 this one centipoise concentration. That amounts to 94 pounds
20 of polymer in 500. We determined -- we have determined by
21 the viscosity that our injection rate of current 880 barrel
22 per day would be decreased due to the pressure regulations
23 in keeping it under control, we would decrease down to approx-
24 imately 500 barrel a day injection rate.

25 So this is based on about a 500 barrel per

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day injection rate economics.

Q. How was Exhibit Eight prepared? Is that some sort of a computerized formula?

A. Yes, sir, it's a computerized run that Halliburton out of their Duncan office has that they run through with the information that's at the top. I wanted this. I asked them if I could get it. They don't give you that information, so this was typed out so it would -- it's the same information. It's just -- they had it in -- on their paper with Halliburton print and trying to reproduce it and all you could see is Halliburton on it.

Q. Did you do anything to confirm that their figures are reasonable?

A. Yes, sir, material balance figuring viscosity and Darcy's regular flow equation comes up fairly close.

Q. Now I see here where they show if you increase the viscosity up to 1.5 you'll get an extra 1.1-million barrels of oil out of the reservoir.

A. Yes, sir. That, there again, those are figures that they put in there. The one that we are utilizing is a one centipoise. We could go for the two centipoise viscosity and it would far exceed what would normally be a tertiary recovery expected recovery. Normally, under a normal waterflood, from past experience it's -- you'll normally re-

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2 coup possibly ten to twenty-five percent of your primary in
3 addition.

4 With your secondary, I mean with tertiary,
5 depending on what you use and how successful, you may get
6 another ten to twenty-five percent of -- of that, but this was
7 based -- what I utilized was theirs, since we're using their
8 program, their information, their polymer, and what not, I
9 just went ahead and stayed with theirs. It calculates out
10 within about twelve percent, you know, on the high side, put-
11 ting in the error for the permeability -- the problem we have,
12 we do not have a core sample and not knowing -- we have cal-
13 culated from logs what our permeability is. We do not have
14 a core sample to -- to know what our specific foot-by-foot
15 permeability is.

16 Q. I'm not sure that I understood out of all
17 that why you're not going for the higher viscosity to get
18 that extra million barrels.

19 A. Well, I guess first we want to see if it's
20 going to work. Secondly, if it does, knowing the way Harvey
21 E. Yates works, we probably will. If it's flooded -- if it's
22 possible to be flooded with two centipoise viscosity, we will
23 do it, just from past knowledge of the way we work.

24 Q. How long will it take before you know that?

25 A. Service companies give an estimate of six

1
2 to eight months, we should start seeing some response.

3 Q Okay.

4 MR. STAMETS: Any other questions of
5 this witness?

6 A I do have a couple of handouts if you would
7 like that is propoganda from Halliburton, if you would like
8 it, for their case histories.

9 MR. STAMETS: I think that would be
10 just fine to have that for the record in this case.

11 If there is nothing further, this --
12 no further questions, this witness will be excused.

13 Does anyone have anything they wish to
14 offer in the case?

15 MR. HALL: Mr. Examiner, I don't know
16 if I moved the admission of Applicant's Exhibits One through
17 Eleven, but if I haven't, I would like to.

18 MR. STAMETS: If you didn't and I haven't,
19 let's do, and they are.

20 This case will be taken under advisement.

21
22 (Hearing concluded.)
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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 Conserva-
tion Division 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. 2825
heard by me on 5-25 19 83

Richard L. Stewart, Examiner
Oil Conservation Division

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