Old Well Rescue: Don't Euthanize, Revitalize! A Workflow*

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Abstract

Innovative and forward-thinking services companies are offering their new products and processes to operators with underperforming wells with the understanding that they will be paid for their products and services out of increased production. "No Money Down Revitalization" is one such approach. First, the operator who is really hurting in this low price environment does not have to put up any initial capital. Second, the service provider is able to charge a slightly higher price to account for the financing and the additional guidance. Finally, geologists and engineers are able to be paid for locating candidates, developing workflows, and overseeing the match-making out of the increase production.

What Are Some of the "No Money Down" Products and Services?

Below are just a few of the companies that have new and improved technologies that will help revitalize reservoirs, especially in mature fields where problems such as low pressure, paraffin, corrosion, and other issues cause problems. Each of these companies is willing to offer a "no money down" approach, or other forms of innovative financing. This is an initial list. We'll be talking to them about their success stories in the future, and we'll provide more case study details.

GreenZyme®: This is a novel enzyme that, when introduced into the reservoir, lowers IFT and alters wettability prompting oil to slide off the inner surfaces of the rock. It works with heavy oil, and in reservoirs of any temperature, salinity, or pH and can function as an unblocking agent to restore permeability. GreenZyme® causes nothing to grow, dissolves nothing, digests

nothing, and will not damage your formation. Initial results on a test in the MidContinent are positive. Olivia Carey at Nzymatica is working with geologists and operators to find ideal candidates.

Bero Solutions: This enzyme solution has been formulated to break up paraffin and other flow-stoppers in mature wells. Initial results from tests in Texas have demonstrated a significant increase in flow. Randy Crow, who heads the U.S. operations, is actively pursuing more candidate wells.

E-Sal: Geoffrey Thyne and his team have developed a new way to alter the salinity of a zone so that floods are 50% more productive than expected, and where non-productive floods can go from 2 percent oil cut to 15 percent.

Coiled Tubing Drilling: Antech has developed a new process that involves an innovative use of coiled tubing. The advantage of this process is that coiled tubing allows you to go in and produce the overlooked or bypassed sweet spots in horizontals. Initial production rates more than pay for the re-entry.

Finding Bypassed Pay using Wireline Tools: New analytics with digitized well logs can be combined with small cased-hole wireline tools that can make the previously invisible productive zones very visible. Allied Wireline Services can work with vertical as well as horizontals to identify sweet spots and bypassed pay.

“Smart” Pumps and Pumping Systems: By studying the flow, pressure, and other characteristics of a mature and underperforming reservoir, New Horizon Drilling can design and install its “smart pumper” system. Results can be dramatic, with up to 500% increase in oil production.

Drill Cuttings Analysis to Identify Overlooked Productive Zones while Drilling: Bill Chandler of Stivers Consulting has developed a new approach that makes hard-to-identify productive zones really “pop” with enough resolution to know exactly where to perf.

Hi-Res Fault Visualization from Seismic: OPPtimal's hi-res fault volumes can be used to find small faults that have been intersected by wells and led to drilling problems (fluid losses, borehole stability issues, casing damage), as well as production problems. Fault volumes can be used to identify and shut off faults that are delivering water, or that allow cross-flow between zones and wells. The volumes can also be used to stay clear of faults, or target sweet spots or compartments in future wells. Ralf Opperman is the contact.

Who Are Some of the Operators?

The operators who are currently benefiting are those willing to take a chance on wells that they had pretty much given up for dead, or at the very least, uneconomic. The operators start with a few test wells, and then, with success, they move on to implement the solution in an entire field. If they have a lot of wells, they have to keep in mind that not all will be uniformly successful. The key success factor is having a knowledgeable geologist/engineer consultant team helping identify candidate wells and planning the workflow/process.

For example, Steven Tedesco, Running Foxes, has offered some of his wells as tests, hoping that if the processes and products work well and significantly increase production, he will be able to repeat them in as many as 50 wells, which could have a significant impact on the company.

Right now, some companies are looking at the model for improving their waterfloods (Denver DJ Basin) and for identifying bypassed pay or poor recovery (East Texas). Other companies are looking at the "no money down revitalization" concept as a fulcrum for entering the often treacherous M&A territory. With a technique for improving revenue, it's not necessary to find the stellar performers and pay top dollar. You can focus on more reasonably-priced production acquisitions.

Conclusions

How can a geologist or engineer identify candidates and help make this process a reality, while also receiving a royalty or production payments? “No money down” services, willing and supportive operators, and a top-notch engineer/geologist team is the best combination.

Being willing to pay from increased production puts the pressure on the service providers and consultants to perform, and it also requires a good-faith effort on the part of the operator, who must be committed to total transparency. This is a grassroots effort to see what kind of change that we can effect in the oil industry. This presentation contains a more detailed step by step guide for reservoir revitalization.

Old Well Rescue: Don't Euthanize, Revitalize!

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The Current Situation

- Underperforming wells targeted for shut-in
  - Uneconomic wells targeted for plugging and abandoning
  - Operators undercapitalized due to almost two years of low prices
  - Many underperforming wells were not updated during high prices
  - Many produce high water-cut, with low oil cut

Challenge Prevailing Assumptions

- When are the “good” wells the ones with the least upside potential?
- What is “risk” in the current climate?
- Are former “deal-breakers” not really deal-breakers in today’s environment?

Potential

The importance of being realistic:

- 1 BOPD increase for shallow wells
- 10 - 25 BOPD increase for deeper wells
- Increase flow and pressure also may mean additional gas (depending on the type of reservoir)
- There will be increased operating costs as well

Workflow for Identifying Candidates: Part I

- Producing less than 30 bbls / month in June 2015
- Ideally, at least 3 wells in the same field (although single wells can be viable)
- Less than 8,000 ft TD (ideally 3,000 - 5,000 ft)
- Well logs and production information available
- Producing interval clearly identifiable

Workflow for Identifying Candidates: Part II

- Operator can be found
- Operator in stable enough financial condition to be able to see out the experiment (no sudden changes of owner, bankruptcies, foreclosures, or sheriff's sales)

Hypotheses on Production Decline

- No reservoir drive
- Scale
- Paraffin
- Corrosion
- Formation damage
- Proppant embedment
- Sanding
- Asphalt
- Diagenesis / crystal overgrowths

Alternative Workflow

Step 1: Identify marginal wells
Step 2: Sort by depth and producing formation
Step 3: Sort by operator
Step 4: Code wells by why they are not producing
Step 5: Develop database

Identifying Solutions

Step 1: Identify the main problems in the well
Step 2: Develop a database of service providers
Step 3: Matchmake between service providers and the wells
Step 4: Develop cost estimates for the services
Step 5: Identify clusters (5 - 10 wells) and create clusters of wells to revitalize

Quick-Look Decision Tool: Guidelines

1. Look at properties (leases, units, individual wells).
2. Assign each property a number. In the description of the property, you'll list the API numbers, etc.
3. Provide information that will not be part of the ranking process. The information will be numeric in order to allow for sorting and comparison later.

Ranking Each Main Category

* Overall condition (4-point Likert Scale: bad, fair, good, excellent)
* Condition of infrastructure (4-point Likert Scale: bad, fair, good, excellent)
* Cost to plug and abandon (dollars)
* Monthly lifting costs (per barrel, average)
* Type of reservoir (limestone, sand, shale, dolomite, etc.)

Additional Rankings: Pt 1

Use Likert Scale (1 – 10, bad to good)

* Effectiveness of environmental solutions
    * Probable net daily production increase
    * Effectiveness of new processes
    * Effectiveness of implementing a solution with new chemical treatments
    * Effectiveness of implementing a solution with new equipment

Additional Rankings: Pt 2

* Effectiveness of implementing a solution with new water flood or chemical flood
* Potential for new infield drilling (relatively inexpensive, with good results)
* Relative attractiveness of existing purchase contracts
* Potential for service provider discounts
* Low ORRI or working interest burdens

Spreadsheet for Easy Analysis

- Rank wells according to their attributes
- For your own purposes, develop a *key indicator* approach

Thoughts

I like the tool because it can be adapted for other purposes as well.

We can also set it up so that anomalous values pop out – with the understanding that anomalous values can be sweet spots or deal-killers.

EXAMPLE OF A SPREADSHEET
QUICK-LOOK RANKING OF PROPERTIES FOR REVITALIZATION

10-point Likert Scale

E18

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	QUICK-LOOK RANKING OF PROPERTIES FOR REVITALIZATION: 1-10 LIKERT SCALE																	
2	Property #	Overall condition	Condition of infra-structure	Cost to Plug & Abandon	Type of Reservoir	Lifting costs	effectiveness of environmental solution	Probable Net Daily Production Increase	effectiveness of new process	effectiveness of new chemical solution	effectiveness of new equipment solution	Effectiveness of new flood	potential for infield drilling (if any)	relative attractiveness of purchase contracts	potential for service provider discounts	low ORRI or working interest burdens	Score (sum of relative positives)	
3																		
4	101	good	poor	$ 25,000.00	sand	$ 7,500.00	10	10	9	10	10	8	7	8	9	8	89	
5	102	fair	fair	$ 35,000.00	sand	$ 11,000.00	10	10	8	6	8	6	5	6	9	4	72	
6	103	excellent	good	$ 15,000.00	sand	$ 8,500.00	8	10	7	8	10	5	6	10	9	6	79	
7	104	good	good	$ 28,000.00	lime	$ 3,750.00	7	8	8	7	7	2	10	9	9	9	76	
8	105	poor	fair	$ 25,000.00	dolo	$ 5,742.00	6	8	5	8	6	7	10	8	10	7	75	
9	106	good	fair	$ 30,000.00	lime	$ 6,410.00	5	7	4	6	7	9	10	6	9	10	73	
10	107	good	fair	$ 31,000.00	sand	$ 6,120.00	2	5	10	4	6	6	7	4	10	9	63	
11	108	fair	good	$ 50,000.00	lime	$ 32,000.00	7	10	8	10	9	8	10	7	10	6	85	
12	109	fair	good	$ 18,000.00	sand	$ 7,800.00	6	9	10	7	10	7	5	10	7	4	75	
13	110	excellent	fair	$ 32,000.00	sand	$ 12,000.00	5	10	3	5	8	6	6	3	8	5	59	
14																		