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OILFIELD SERVICES SEMINAR

Challenges for Commercializing New Technology.
Using Collaborative Strategies to Bridge the Gap.

October 5, 2017

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Challenges in Commercializing New Technology



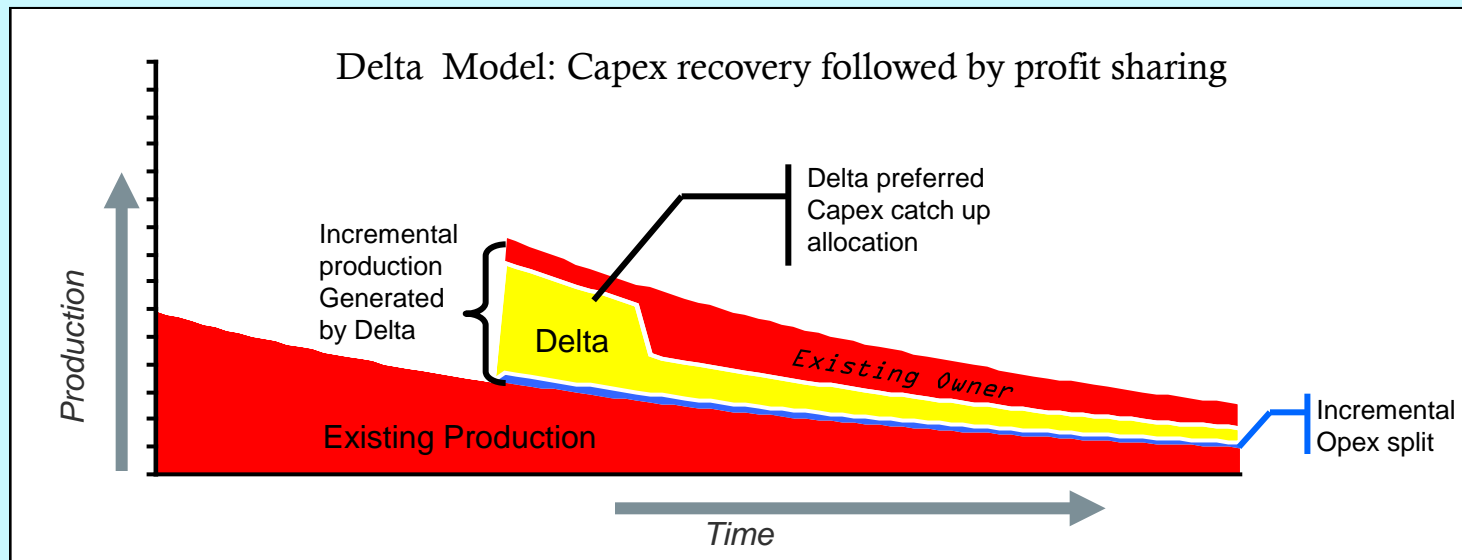
Agenda

- Introduction
- Delta Hydrocarbons business model
- Tachyus technology
- Challenges
- Tactics
- Conclusion/questions

Delta Hydrocarbons BV

Delta Hydrocarbon's Value Proposition – in concept:

- Agree with asset owner: base line production, incremental field development & reward for incremental revenue achieved on incremental production
- Delta invests capital, is responsible for execution and assumes risk



Delta Hydrocarbons seeks contractual relationship that rewards investment risk with incremental revenue

TECHNOLOGY BREAKTHROUGH: DATA PHYSICS

Physics and Simulations

$$Q = \frac{-kA}{\mu} \frac{(p_b - p_a)}{L}$$

Darcy's Law

$$\frac{\partial}{\partial t} \left[(1-\phi)p_M U_M + \phi \sum_{k=1}^P p^k U^k S^k \right] \dots = 0$$

Conservation of Energy

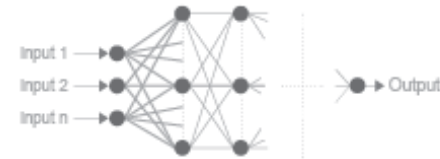
$$\frac{\partial}{\partial t} \left(\phi \sum_{k=1}^P p^k x_i^k S^k \right) - \sum_{k=1}^P (p^k x_i^k V^k + S^k J_i^k) - Q = 0$$

Conservation of Mass



TACHYUS
Data Physics™

Data Science and Machine Learning



Neural Networks



Fuzzy Logic

0	77	686	479	5	7	09	459	682	70	4	04
992	910	9	62	9	164	1					
002			49	25	3	995	564	673	3	21	5
61			31	860	82	22	791	772		847	
280	866	109	47	420	80	93	91	940	0	018	724
21	97	125	42	426	425	411	692	4	41	242	0
255			2	45			7	1	482		
503			0	206	484	5	144	2	79		
0	4	870	107	8	04	3	998	24	226		
761			25	052	6		128	044	911		
468	817	94	9			3	52	124	281	9	829
731	731	24				25	245	164	9	405	1

Machine Learning

Data Physics technology is a **proprietary blend of machine learning, physics-based reservoir modeling, and advanced optimization techniques.**

This breakthrough methodology allows models to be built in days and simulations to be run in minutes, fundamentally altering the way decisions are made.

OPTIMIZATION SOFTWARE

Recovery Techniques



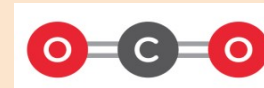
Cyclic Steam



Steamflood



Waterflood

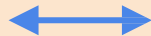


CO₂ Flood



Polymer

Field Development



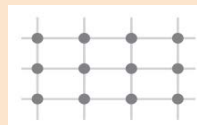
Horizontal redistribution



Vertical redistribution



Infill drilling

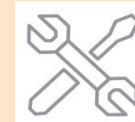


Pattern development

Operational Excellence



Pump optimization



Predictive maintenance



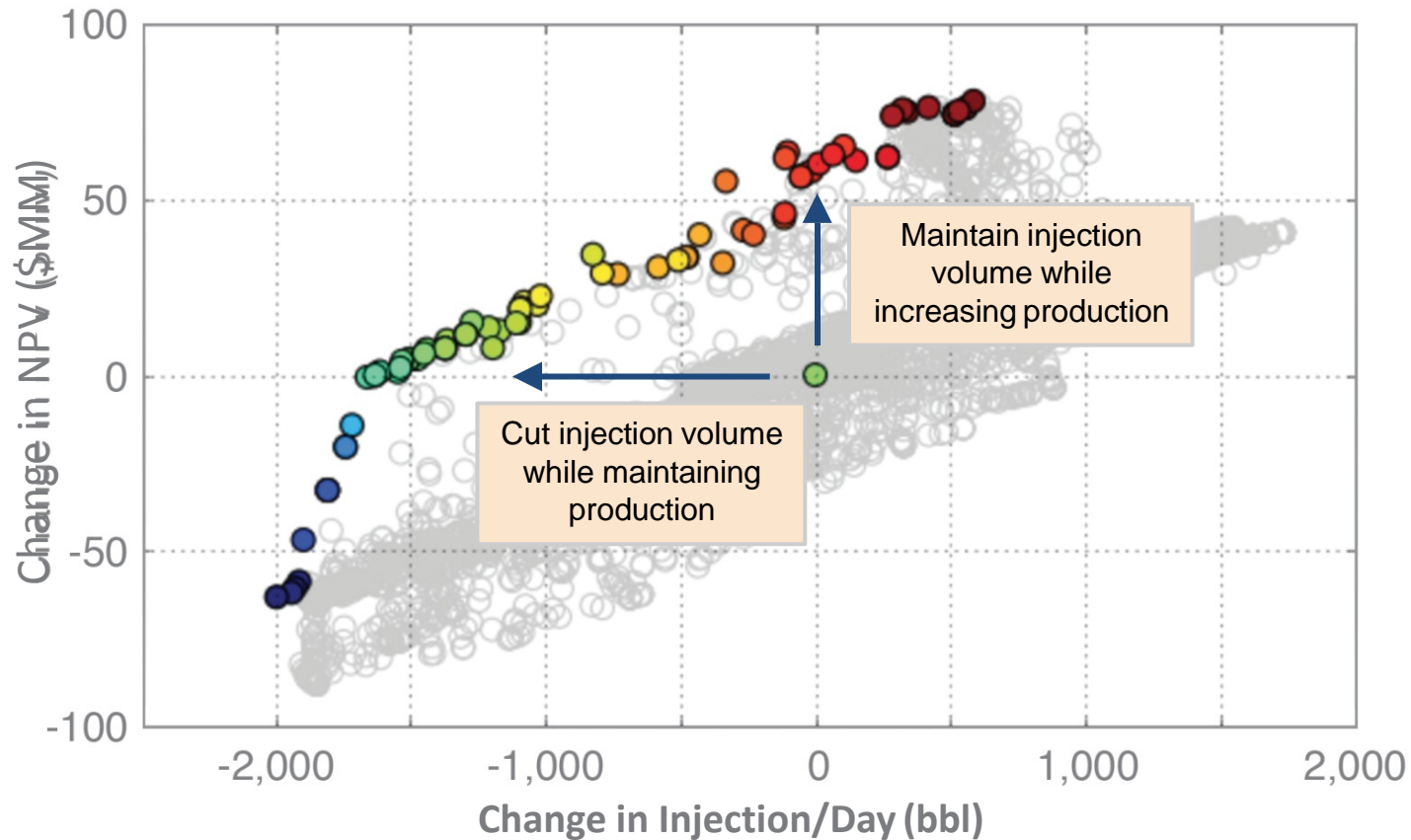
Production alerts



Workover selection

Data Physics technology is applicable to optimization problems spanning recovery techniques to achieve optimal field development and operational excellence.

QUANTITATIVE OPTIMIZATION





"We're ready to begin the next phase of keeping things exactly the way they are."

The New Yorker, 2011

Challenges



- Different timeframes
- It was “not invented here”
 - Lost in the crowd
- Resistance to change/risk aversion
- Internal focus/other agendas/staff turnover
- Government approvals
- Oil price volatility



Tactics

- Price discounts for speed
- Bottoms up, top down
- Smaller companies for proof of concept
- SPE papers - credibility
- Low risk start
- Hire experts

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How to Put Together an OFS Strategic Alliance for Technology Development

Bill Kleinman
Haynes and Boone, LLP

October 5, 2017

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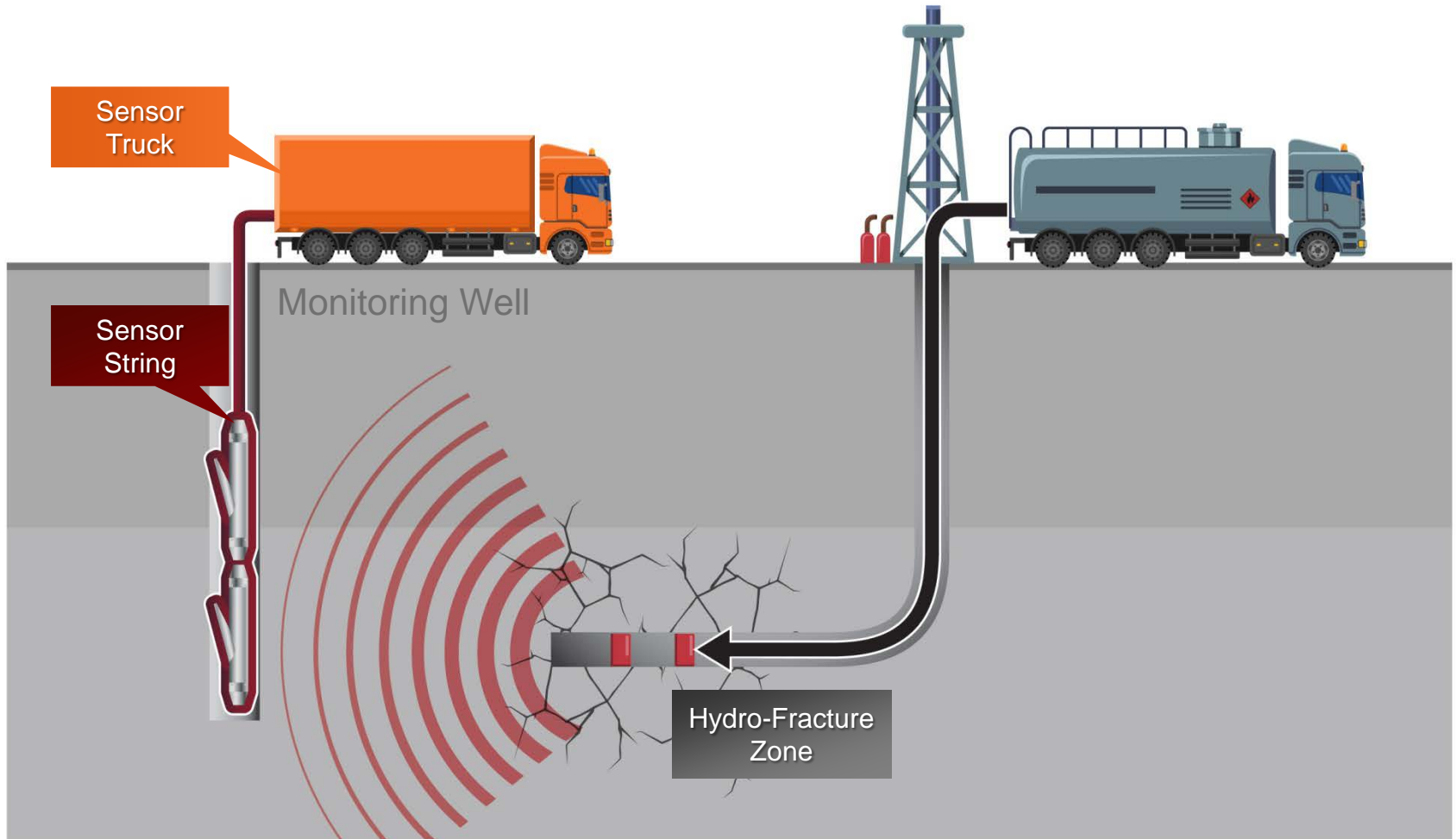
What is a strategic alliance?

A good way for a company to access new technology or enter a new market.

- Collaborative effort with another company.
- To create a joint product.
- They share the risk and reward.
- Called “partnering.”
- But not a Partnership or JV – just a special contract: “Strategic Alliance Agreement.”

Today's Example: MSM

- Microseismic Monitoring of Horizontal Fracing



MSM Services Inc.

- **Their Current Service:** Provide monitoring services in the field for frac jobs. They use sensors, a monitoring well and software to visualize the frac in process.

- **Their Big Idea:**
 - Competitive advantage over other MSM companies.
 - By reducing job cost and time.
 - → Use Artificial Intelligence software during the job to recommend changes to the frac parameters in real time – pressure, volume, slurry recipe, etc.

To do this, MSM Services *needs*:

- **New sensor technology**: faster, gather more data, sense more frequencies, multiple monitoring wells, go vertical and horizontal.
- **New software**: Incorporate AI into what they currently use.
- MSM Services Inc. can do sensors, but they need a source for the software.

MSM Services needs software – why partner?

MSM Services Inc. Growth Strategy	Pros	Cons
Build their own MSM software.	<ul style="list-style-type: none"> Control the resources. Capture all of the profit. 	<ul style="list-style-type: none"> New business: software. New technology: AI software Invest capital; capital at risk. Time to market.
Buy an MSM software company.	<ul style="list-style-type: none"> Faster to market. Access existing technology. Access existing operations and customers. 	<ul style="list-style-type: none"> Costs more. Integration risk. Baggage.
Partner with an MSM software company.	<ul style="list-style-type: none"> Fastest to market. Lowest cost / least capital. Share the risk. 	<ul style="list-style-type: none"> Limited control of resources. Share the profits. Deal with the partner.

MSM Software Co. has the Capabilities

- MSM Services approaches their current supplier, MSM Software Co., with the Big Idea.
- *They decide to partner.*
- Normally a sw license would be involved – *because of the potential risk and reward, they will share revenue.*

Business and Legal Team

- How do we put this strategic alliance together?
- How do we increase the odds of success?

Four things to focus on in the Strategic Alliance Agreement:

No. 1: Get the *Right Partner*

- *This is a journey. Unexpected things will happen, and these scenarios will be addressed in the SAA.*
- Consider partner:
 - Temperament
 - Capabilities
 - Commitment
 - Staying Power

No. 2: Clearly Define (and Agree Upon) the *Joint Output*

Examples:

- “A cool new way to do frac jobs.” (*Bad*)
- “A system of AI and sensors to change frac parameters in real-time.” (*Better*)
- “A system of AI and sensors... that will reduce operator cost by 10% and recover our investment in 18 months.” (*Much better*)

No. 3: Develop a *Joint Project Plan*

- *Who does what when?*
- *Any gaps in the responsibilities?*
- *Milestones*
- *Deliverables*
- *KPIs*

Project Plan: Development Phase

Milestone or Action Item	Completion Date	Party Covenants, Deliverables, and KPIs	
		MSM Software Co.	MSM Services Inc.
Development Phase			
Develop Prototype of Joint Solution	_____, 2017	Develop new AI Software. Support sensor development.	Develop new sensors. Support software development
		<i>Gap: Who designs the new sensor array?</i>	
Field Test	_____, 2017	Find one friendly customer for a field test.	Find one friendly customer for a field test

Project Plan: Go to Market Phase

Milestone or Action Item	Completion Date	Party Covenants, Deliverables, and KPIs	
		MSM Software Co.	MSM Services Inc.
Go to Market Phase			
Develop Sales and Marketing Channel	_____, 2017	Support sales efforts. Become referral partner. <u>Referral KPIs:</u> 2017: ____ 2018: ____ 2019: ____	Lead the sales efforts. Manage the pipeline. Pipeline to be visible to MSM Software Co. <u>Sales KPIs:</u> 2017: ____ 2018: ____ 2019: ____
		<i>Gap: Market to engineers, service companies or operators? Who leads marketing?</i>	

Project Plan: Operating Phase

Milestone or Action Item	Completion Date	Party Covenants, Deliverables, and KPIs	
		MSM Software Co.	MSM Services Inc.
Operating Phase			
Deliver the service in the field.	Ongoing	Provide software support to MSM Services Inc.	Deliver advanced microseismic monitoring to fracing companies.
		<i>Gap: Who interfaces with the fracing engineers in the field to implement the AI recommendations? What if they push back?</i>	

No. 4: Don't let *Exclusivity, Non-Competition and Joint IP* kill the deal

Defining the **Project Boundaries** makes these problems manageable.

Alliance Boundary Tool	
<i>Technologies</i>	1. Artificial Intelligence software 2. Fracing software 3. Sensor technology
AND	
<i>Applications</i>	Real-time control of frac parameters for jobs in progress.
AND	
<i>Markets</i>	Shale fracing.

Exclusivity and Noncompetition

- Inside of the boundaries: The parties are exclusive for a two year minimum; extendable to five years if annual revenues are at least \$25 Million. The parties will not develop competitive products inside the boundaries.
- Examples:
 - Vertical wells
 - Steam injection? (Should the market be *Well Stimulation?*)

Exclusivity and Noncompetition

- Outside of the boundaries: Each party has a ROFR to participate in opportunities that are outside of the boundaries. Or maybe no restrictions at all.
- Examples:
 - Salt water disposal
 - Mining
 - Chemotherapy

Joint IP

- “Ownership” is a four-letter word.
- Subtext is who captures the value of the IP? And that the partners are also potential competitors. “Frenemies.”
- *Instead, focus on the **right to use the Joint IP**. This will in turn drive ownership, licenses, fields of use, royalties, etc.*
- *Changes a legal discussion to business discussion, then implemented in the Strategic Alliance Agreement.*

The Right to Use Tool

Joint IP: Right to Use Tool					
The Joint IP may be used as follows:	Patents	Technical Know-How and Trade Secrets	Marketing Information	Business Practices	Data
Inside Boundaries					
Outside Boundaries					
During Alliance					
After Alliance					

Right to Use the Patents

Joint IP: Right to Use Tool

The Joint IP may be used:	Patents
Inside the Boundaries	Either party may use the jointly developed Patents to enhance their own products for use inside of the boundaries.
Outside the Boundaries	<p>Neither party may use the jointly developed Patents outside of the boundaries to compete. <u>Example</u>:</p> <ul style="list-style-type: none">MSM Software Co. is already in the <u>disposal well monitoring business</u>. If MSM Services Inc. enters this business, it cannot use the joint Patents to develop software, alone or with a different partner. <p>Otherwise, either party may use these Patents outside of the boundaries with a payment of royalty to the other. <u>Example</u>:</p> <ul style="list-style-type: none">MSM Software Co. wants to visualize <u>chemotherapy</u>. They may use the Patents to develop products as long as they pay a royalty to MSM Services Inc.

Recap

Key Elements for the Strategic Alliance Agreement:

1. Get the right Partner.
2. Properly define the Joint Output.
3. Jointly work out the Project Plan.
4. Focus on the Right to Use instead of ownership to solve non-competition, exclusivity and joint IP.

Thank you.

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