RIG CAPABILITIES
For Multi Well/Pad Development
Advantages to Multi-Well Pad - Continuous Operations

- Minimize EHS Risk
- Less iron to move
- Less trucking
- Less risks for spills
- Fewer or no Well Heads to avoid
- Rig Release to Spud in less than 24 hours
- No need to refurbish location between wells
- Reduced Mob-Demob for drilling and completions
- Potential Cost Saving of $750,000+ per well
- Less lost circulation and other hole issues
- No damage to existing well bores during completion
- No loss of revenue from offset wells being SI
Challenges

- Well Path Design
- Well Pad Layout/Orientation
- Rig Footprints/Setup/Availability of Rigs that can Walk or Skid
- Compatibility-Well Pads (One Design Fits All)
Advantages to Pre-planning

- Reduced Risk of Collision with older Well Bores.
- Less Directional Work
- Reduced Cost
- Better Hole Quality
- Minimize Number of Pads needed to develop acreage
- Design Preferred Pad Orientation
Examples Of Challenging Situations

- Existing Wells On Location
- Non-Preferred Location Orientation
- Lack of Section Development Plans (Due to Existing Non-Productive Wells, Severe Faulting, Etc.)
- Poor Location Placement for Drilling Multiple Wells (Possibly due to topography or land complications)
Current Project – Full Section Development (Planning Stage)

- **Beckham 1-27H**: 990' FWL
- **Sharon Mae 1-27H**: 440' FEL
- **Sharon Mae 2-27H**: 1410' FEL
- **Beckham 3-27H**: 2380' FEL
- **Beckham 2-27H**: 1960' FWL
- **Beckham 4-27H**: 290' FWL

**Pads:**
- **Pad 1**: 990' FWL, 315' FSL
- **Pad 2**: 2646' FWL, 150' FSL
- **Pad 3**: 1625' FEL, 18' FSL
Current Project – Full Section Development (Planning Stage)

Pad 1:
- Beckham 1-27H
  - 990' FWL
  - 315' FSL
Pad 2:
- Beckham 2-27H
  - 1960' FWL
  - 150' FSL
- Sharon Mae 2-27H
  - 1410' FEL
Pad 3:
- Sharon Mae 1-27H
  - 440' FEL
  - 18' FSL
Example Of Optimum Situation

- Preferred Pad Orientation
- No Existing Wells on Location
- Section Development Plan
Directional Issues With Existing Pads

- Increased Risk of Collision
  - Well paths may cross
  - Insufficient Survey Data from Offset Wells
- More Directional Work
  - More Survey Time
  - Lower ROP
  - More Bits
  - Increased Days on Location
Rig Capabilities

Analyze the capabilities of Rig Types to determine which rig type offers the “Optimal Solution For Pad Drilling”

• Skidding Rig/Conventional
  • Walking Rig
RIG TYPES

• Overview of a range of rig types including different walking and skidding rig types and evaluating the pros and cons of each for pad drilling
• Evaluating whether walking or skidding rigs offer a more cost-effective option
• Evaluating which rig designs allow for the closest well spacing to deliver improved production efficiencies
• Quantifying the distances that can be skidded by different rigs to determine what limits rigs impose on well spacing on the pad
RIG SELECTION/OPTIONS

- Conventional Rig - Skid using 3rd party trucks or outfitted with equipment such as Hillman Rollers to expedite skidding operation.

- PROS – Day rate will typically be less than walking rigs. Rig will/could be adequate if you are moving back on a location with a previous drilled well. Normally, these rigs can be secured with a shorter term contract, may fit an Operator that does not have a longer term development plan.

- CONS – If you are Drilling more than one well on a Pad, will require laying down of all DP before the rig can skid. Will require moving of all drilling related equipment before the rig can spud. (Pumps, Pits, Generators, SCR, ETC). Release to Spud Time 2-4 Days. Cannot justify the rig move cost on a Multi-Pad Development with more than 2-4 planned well bores, if they are drilled Back-To-Back. Larger Foot Print For Skidding, typically 35’+. 
RIG SELECTION/OPTIONS

Conventional Rig - Skid with Trucks
RIG SELECTION/OPTIONS

• Rig Equipped to Walk – Rig equipped with a Versitic Rig Walker or Similar Equipment. (Nabors - Jack and Claw, Axon Energy – Lift and Roll)

• Drilling Contractors Equipping Rigs with the Versitic Rig Walker or Similar Equipment – Cactus Drilling, Desoto Drilling, Felderhoff Brothers, Nomac Drilling, H&P Drilling, Nabors, Patterson-UTI.

• Can be retrofitted for any existing rig either directly to the substructure or through use of a pony sub.

• Ability to skid the rig in 8 directions.

• Requires Modifications To The Electric Cable Trays.

• Requires Modifications To The Flow Line, Choke Line and Kill Line.
RIG SELECTION/OPTIONS

- Walk the rig with full set back (No Rig Down). Depending On Derrick Configuration, can walk with as much as 25,000’ Feet of DP standing in the derrick.

- Some Walking Rigs have the capability to drill as many as 28 wells per pad on 10’ spacing or 16 wells per pad on 20’ Spacing. (400’ x 400’ Pad)

- Improvements to The Solids Control System Should be evaluated for Multi Well Pad Development, to minimize problems with solids in the active pit system.

- BOP Trolley System should be utilized.
RIG SELECTION/OPTIONS

PROS – As our business continues to include more Multi Well Pad Development, the New Build Walking Rigs or the Older Rigs that have been Modified are more readily available. The design of most Walking Rigs will allow the Operator to fully develop a pad in phases if necessary. Optimal Well Spacing can be 10’, 20’ 30’ or 40’ with no modifications necessary to the rig, If spacing varies. Allows Operator to batch set Surface or Intermediate Casing Strings before Production Hole is drilled. Drilling Fluid can be swapped out one time if Production Hole requires a Different Mud System than the Surface or Intermediate Section(s). Shorter Rig Release to Spud – Can be as Quick as 12-24 Hours. No Trucks or Third Party Equipment required to walk to the next well. Requires a smaller Foot Print to Drill Multiple Wells on one pad.
CONS – This Type Of Rig is not a fit for all Operators. Typical Day Rate can be as much as $7,500 more than a Conventional Rig. Normally required to sign a term Contract of at least 24-36 months for a New Build Walking Rig. Possible Lesser Term Days on an upgraded Rig. Rig moves must be minimized to justify higher day rate. A Long Term Development Plan (Per Section) should be in place before rig is contracted.
Woodford Development in SE Oklahoma: 4 Wells Were Drilled, The Rig Was Released, The Wells Were Completed and Put To Sales. The Rig Moved Back In and Drilled 4 Additional Wells. Original Wells Were One Section Laterals Drilled North x South. The 4 Additional Wells Were One Section Laterals Drilled South x North. (Developed the West Half of Two Different Sections – 190 FLL and 600’ between Laterals.)
Two Section Development. Drilling 8 Wells per pad. Laterals placed 190’ from lease line. Lateral Centers 612’.

Optimum Pad Placement

Pad #1:
East/West Placement: 1460’ FEL
North/South Placement: As close to the section line as possible

Pad #2:
East/West Placement: 1460’ FWL
North/South Placement: As close to the section line as possible
Previous Pad After The First Four Wells Were Drilled
Prepare To MIRU For Next 4 Wells
Versitic Walking System
Benefits of the Rig Walker
Skid your rig in 8 directions with full setback in place eliminating rig down
2.4 million pounds lift capacity
Walks 40 feet in 1 hour
Level the rig while drilling
Retro-fitted to most rigs
Compact design for easy use
Counter balance valve for better protection
Safe, fast, and versatile