The Study

The Petroleum Services Association of Canada (PSAC) is pleased to report the results of a study conducted on its behalf by MNP LLP. In late 2013, PSAC recognized the need for a more accurate picture of workforce requirements created by the new generation of resource play wells that employ horizontal drilling and multistage hydraulic fracturing. This report aims to increase the understanding by members, government and educators of the types of workers and skills required to sustain development activities.

To determine the workforce required, PSAC approached MNP LLP to study three representative-type wells:

- A Horn River deep tight gas well typical in northeast B.C.;
- A natural gas liquids well from central Alberta;
- A tight oil well from southeast Saskatchewan.

While the actual equipment and services required for each of these wells is similar, the access costs, the depth and length of the horizontal well, and the number of hydraulic fracturing treatments are all different resulting in varying costs and total employment requirements.

The Workforce Requirements

The breakdown of workforce requirements outlined in this report are based on the actual horizontal well count for 2013, with the understanding that year-over-year PSAC anticipates the application of this type of well will continue, thus making the information contained herein relevant for several years subject to minor adjustments for material technological, operational or engineering advancement.

The research includes information from drilling engineers, drilling superintendents, drilling contractors, well servicing and supply companies, service rig contractors, and equipment suppliers. It is the first study of its type that captures direct field employment on this type of drilling and completion activity.

To reach the total employment figures, for each well every service and type of equipment required from site survey and lease preparation through to having the well ready to go on stream is included. A minimum of 44 individual and unique drilling, service and supply companies (assuming all rental equipment comes from one vendor which is not likely to be the case) are contracted through the course of the drilling and completion process, employing personnel with 25 unique skill sets based on education, vocation, years of experience in various elements of the wellbore construction, completion and production process. A complete list of the services contracted provided is contained in Appendix A.

Also included in the study, is the number of people employed on each well type and the total person - days of employment per well. A multiplier of 0.2 for drilling and service field office and administration has been applied, meaning that for every five workers in the field there is one person employed at that company handling all other aspects of the business from field dispatch and repair to safety to finance and administration.

Of note:

- The number of people employed on the non-drilling completion and operations support elements of these types of wells substantially exceeds the number employed during drilling.
- The specific equipment and services required for each wellbore profile are similar, however the remoteness and depth of the wells in Northeast B.C. make these wells significantly more labor intensive than shallower wells in more developed areas with easier road access such as Central West Alberta or Southeast Saskatchewan.
In the past, it typically took 75 workers to drill and complete a well. As of 2014, it now takes between 239 and 302 workers.

In 2013, work on horizontal / multi-staged fractured wells equaled 60,863 typical full-time jobs!

The following workforce requirements are not included in this study.

- Direct or indirect other employment categories critical to the well being drilled including:
  - Oil company personnel or suppliers involved in exploration, land acquisition, engineering or finance. Any input labour for the fabrication, processing, or manufacturing of any component, equipment, fluids or chemicals employed.

- Transportation personnel employed other than to move equipment and supplies from the nearest field service location to the wellsite.

- Any workforce requirements or costs associated with field treatment of the produced resources such as natural gas plants, compressor stations, oil batteries, or removal or disposal of produced water.
APPENDIX A - List of unique contractors employed by product or service

Surveyor
- Construction Company
- Trucking (Heavy Equipment) Class 1
- Trucking (Rig Moving) Class 1
- Trucking (Pipe) Class 1
- Trucking (Light) Class 3
- Camp and Catering
- Camp Waste Water Disposal
- Communications Equipment Supplier
- Equipment Rentals
- Conductor Hole Contractor
- Water Hauling
- Safety Services (H2S Medical) Contractors
- Drilling Instrumentation
- Drilling Contractor
- Casing & Tubing Supplier
- Power Tong Services
- Cement Supplier
- Cement Accessories
- Cementing Services
- Packer and Service Tool Services
- Casing Accessory Suppliers
- Drilling Supervisor

Geologist
- Directional Drilling Services
- Drilling Tool Suppliers
- Rock Bit Suppliers
- Drilling Mud Services
- Solids Control Equipment Rentals
- Drilling Waste Management Services
- Service Rig Contractor
- Wellhead Protection Services
- Frac Pool Rentals
- Pressure Pumping Services
- Fire/Shower Services
- Production Testing & Flowback Services
- Coiled Tubing Services
- Completions Supervisor
- Wellhead & Valve Supplier
- Production Tank Supplier
- Artificial Lift Equipment Supplier
- Production Separator Supplier
- Instrumentation Supplier
- Mobile Welding Services
- Flare/Incinerator Provider
- Site Fencing Contractor

APPENDIX B - Technical References

Mickey Sutherland P.Eng., President & CEO, Pajak Engineering Ltd.
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