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## Articulating Frac Arm *(Patent Pending)*

### *Increased Efficiency and Safety in Frac Applications*

Well pumping service providers continuously seek ways to improve efficiency and enhance safety during fracturing operations. There are several challenges that these companies face everyday at the job site and FMC Technologies' Articulating Frac Arm addresses some of these issues:

The area between the frac truck pumping unit and the collection manifold is usually very cramped and cluttered, which provides safety hazards to personnel while assembling or disassembling temporary flow line iron in these areas.

**Solution:** FMC Articulating frac Arm is a pre-assembled piping system that extends from the frac truck to the manifold with significantly less effort. The clutter of flow line iron on the ground is eliminated.

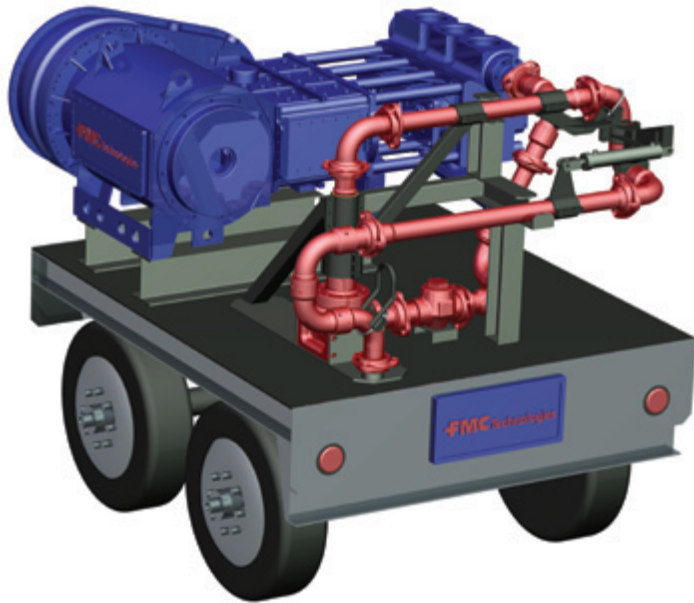
In wet weather conditions, swivel joints and pup joints are laid in mud, sand, or gravel. High pressure pumping units pulsate considerably during fracturing operation and cause flow line piping to vibrate. Wing unions, swivels, and pup joints are pounded into the mud during the course of the

job. Mud, dirt, or gravel covers the piping so the threaded connections need to be cleaned frequently.

**Solution:** FMC Articulating Frac Arm does not touch the ground. The necessary degrees of freedom is built into the design of the Arm eliminating fatigue loading due to binding. Because the Arm bridges the truck to the manifold, it remains free of mud and iron does not wear from pounding into the ground. The connecting union remains clean and easy to assemble.

During rig-up time, the field operators must attach flow line components, as needed, between the pumping units and the collection manifold. The current practice requires the operators to carry and assemble iron between the pump truck and manifold. A "dog-leg" swivel arrangement is constructed behind each truck to allow the degrees of freedom necessary to keep piping from binding as the pipeline pulsates. Choosing correct pup lengths, carrying iron, and hammering the assembly all together increases rig-up time significantly.

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FMC Technologies Articulating Frac Arm uses technology employed in marine and truck loading arms and applies it to the fracing operation.

FMC Articulating Frac Arm is designed to fit any frac truck.

Weight - 1000 lbs.

During rig down, disassembling the frac line is much harder with the conventional layout because the iron has been shaken to a binding position. Breaking the wing unions free is not an easy task.

**Solution:** FMC Articulating Frac Arm assembly has the necessary swivel joints and piping required to connect the pump discharge to the collection manifold in any configuration within a 12 ft. span. Only one connection is rigged up (or rigged down) for each pumping unit. The Arm's significant reach and balance allows one man to extend and connect it to the manifold with minimal effort in a matter of minutes. Choosing piping, carrying heavy iron over slippery and hazardous ground clutter, cleaning threads, and hammering is the old way of rigging up.

## Key Features & Benefits

The Articulating Frac Arm is easy to operate. It reduces multiple hammer wing union hook-ups to only one connection.

- It considerably reduces the rig up and rig down time.
- Safety is enhanced since the Arm is designed to reduce hammer injuries and exposure hours, back injuries, and trip hazards during fracing operations.
- The Arm operates at pressures up to 15,000 psi and allows free movement produced by the high pressure well service pump without any binding.
- The Arm reach capability allows the frac truck to be easily spotted within 12 ft. of the manifold and connect to frac or ground manifold from 6 ft. elevation to ground level.
- World proven Chiksan® TripleStep swivel joints provide added swivel joint bearing load capabilities extending the life of the system.
- FMC factory sales and technical support available:
  - Engineering layout advice
  - Field technical support
  - Installation and maintenance manual

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