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Mechanical Drill Spindle Feed

Prior to 1988 all drilling lines for structural steel fabrication on the market employed a hydraulic spindle feeding mechanism, which had some favorable adaptability when generating holes in structural steel.

Structural steel, being subject to a wide range of mill tolerance deviations, would frequently have material surface locations that were not always predictable. Hydraulic spindles could be advanced as a relative fast rate to find the material surface then proceed with a high pressure to drill and the sense the completion of the hole once the resistance was reduced.

Unfortunately the hydraulic feeds rapid advancing of the drill substantially reduces the tool life that results from the rapid impact of the tool to the material.

During the end of the hole making process the tip of the drill is the first part to emerge from the backside of the hole.

As this portion of the drill requires over 85% of the power to generate the hole once the tip starts to protrude through the hole the feed rate rapidly advances like the release of a spring as the hydraulic pressures that is pushing the spindle drops.

This rapid acceleration of the tool at the end of the drilling cycle deteriorates the tool life along the edges of the cutting surface as they extend from the tip of the drilling tool.

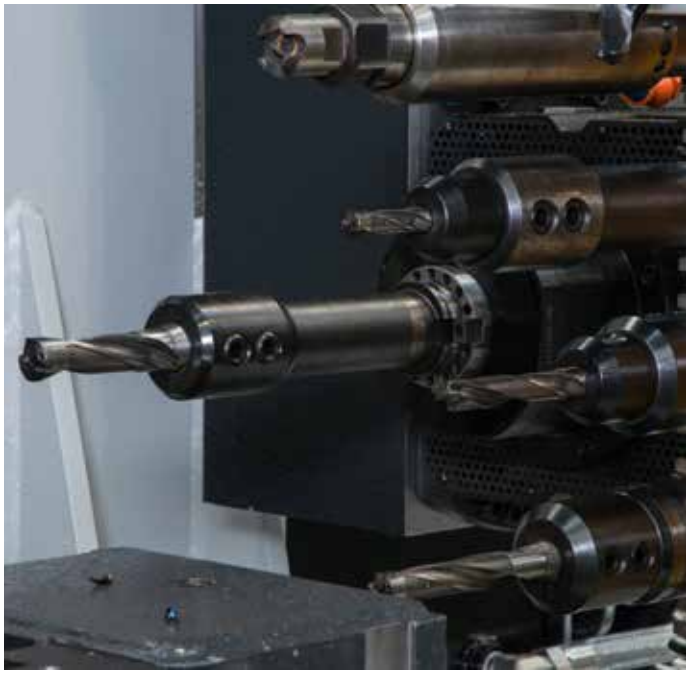
Understanding that tooling cost is a realist component of the total fabrication cost, FICEP started to switch their drill lines to offer mechanical spindle feeds in 1988.

The mechanical spindle feed overcame the negatives of the hydraulic feed and expanded the versatility of the drill line at the same time.

Users of FICEP drilling lines with mechanical spindle feeds immediately realized the following benefits:

- Rapid impact of the drilling tool to the material was eliminated, as the mechanical feed was a programmable axis.

- As the spindle feed became a controllable axis the software could take into consideration the section size and not just rapid the tool to the material but then feed the tool at a uniform rate to maximize tool life.



- As the tool exits the hole it does not accelerate like in hydraulic designs.
  This uniform feed rate extends tool life.

- Since both the spindle feed and the rotational axis of the mechanical feed are controlled axis, the mechanical feed can be used for tapping and countersinking for example.

- The CNC knows the position of the tool versus the material so depth control of the spindle becomes programmable. This enables such additional functions as
  - Drilling of blind holes
  - Countersinking
  - Counter boring

As carbide insert tools were develop for the drilling of structural steel FICEP was already on the market with mechanical spindle feeds across its product line.

This is a requirement to utilize high performance tools like carbide as this tooling technology demands a uniform spindle feed to achieve optimum tool life and feed rates that are generally 8-10 times greater than outdated high steel twist drills.

Initially the mechanical feeds used ball screws to feed the drilling spindle.

Most recently FICEP has engineered the use of precision rack and pinion system as this design has proved to be more durable in the plant environments generally utilized to fabrication structural steel.

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