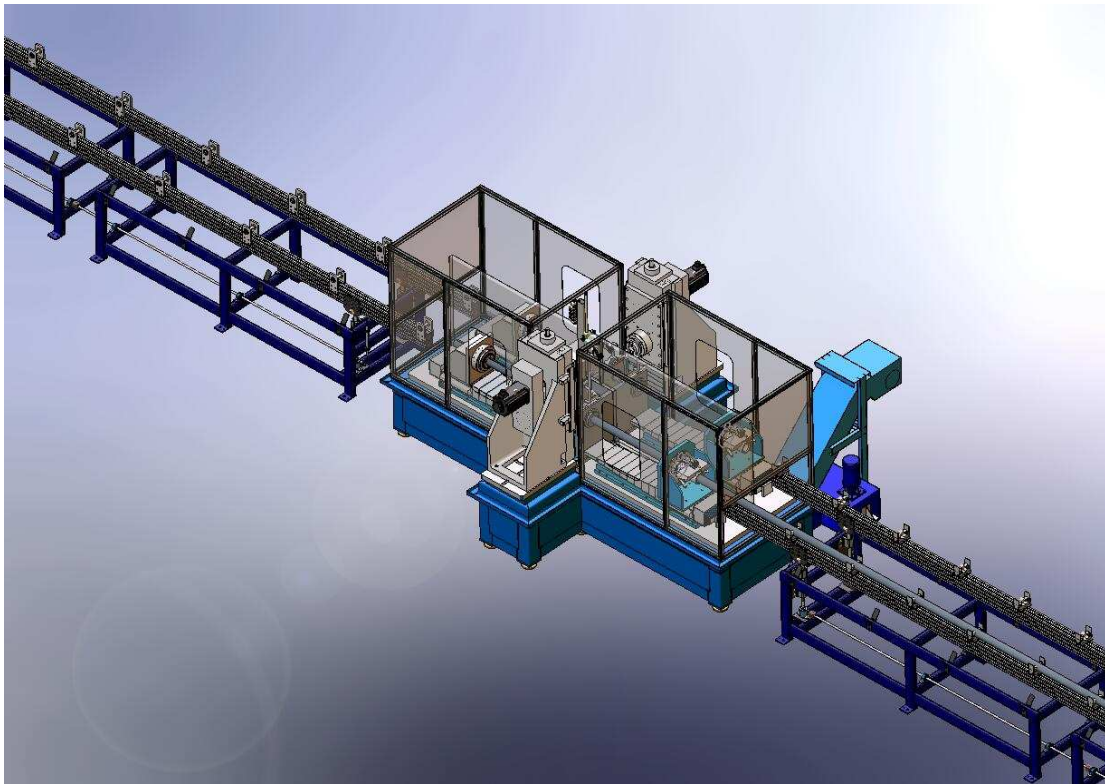


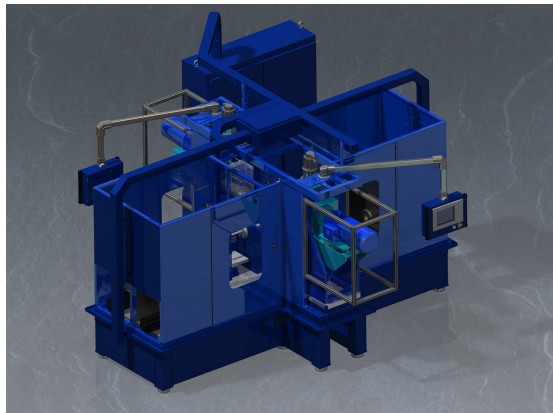
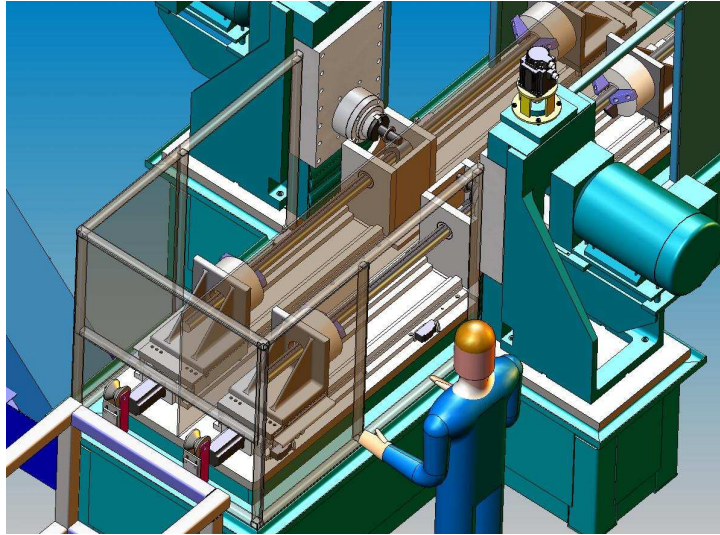
Case Study – Milling Keyways

The customer manufactures oil field pumps that require the use of long shafts. These shafts are keyed before assembly so that all elements of the pump – both rotating and stationary – have a fixed relationship to the shaft. The plant operates 24 hours per day, six days per week.

Machine Requirements

- To cut keyways in shafts from 29 inches to 40 feet long
- There are two keyway sizes; the machine must be capable of cutting both
- There are shaft diameters from 9/16 inch to 2 7/8 inch
- There shaft lengths up to 40 feet, the machine must be infinitely adjustable as to shaft length; some shafts have no-touch zones as well
- The machine is to deburr the keyways
- The machine is to use continuous gauging of the keyway depth
- The controls need to monitor tool wear of three sets of cutting tools
- The machine is to have two cutting heads and be able to run one or both at a time
- The machine must have an infeed queue of several shafts for each cutting head





Description of the Machine

- ✚ TEC designed and built this 100 foot long machine using a reciprocating carriage principle for each of the two milling lanes – the leading end of the shaft is passed through the first collet chuck to the second collet chuck and then alternately pulled and pushed through the cutter head
- ✚ Stabilizers and fixed end stops are used to assist the operators for the initial part feed through
- ✚ At least one collet chuck has control of the shaft at a time; there is overlap where both collet chucks are controlling the shaft's movement
- ✚ It is a centerline machine with the ability to raise and lower the infeed and exiting parts lanes to match the chuck and bushing centers and the required keyway depth
- ✚ The machine uses a PLC based control scheme with dual and redundant HMIs, AC spindle drives and AC servos
- ✚ The depth of the keyway is measured by a laser and continuously fed back to the raise/lower servo for each lane
- ✚ The deburring is a loaded machine tool insert used to scrape the keyway edges
- ✚ The machine has a coolant flush system and chip conveyor

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