INSTITUTE OF ROLL DESIGN

Inaugural Micro-mill Work Group

Fall 2024

Test Stand Development and Safety Development for a Micro Mill

Why is there a need for a micro-mill working group? Is there really a difference in rolling mills that we need this group? We have seen mills like TSI that hand feed a mill. Some of us have seen and worked in a cross-country mill. What have we learned through the years?

What challenges are there now.

We have evolved. We have improved our processes. We have learned from our mistakes.

Cross country mills with twist guides and repeaters became traditional horizontal inline mills with twist guides then we developed horizontal vertical mills.

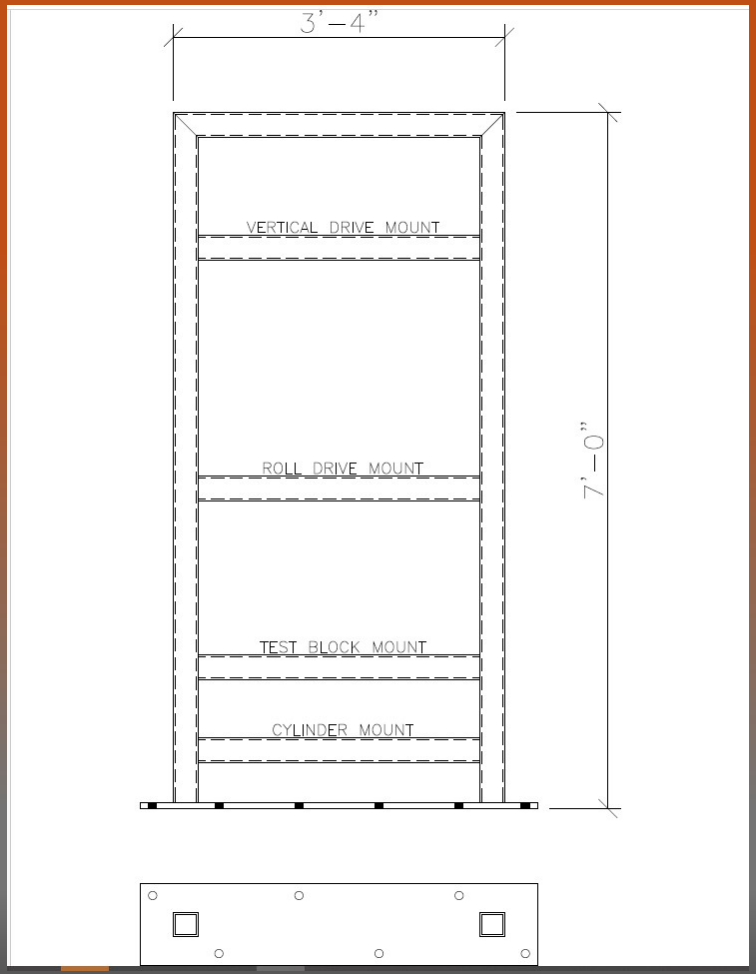
All these innovations had a couple of drivers. One being increased production, which is important for the companies, shareholder, and employees alike. Second is an increasing awareness for safety in our industry.

Micro-mills give us advantages that we have talked about for so many years. Wouldn't it be nice to get rid of all the head ends? Wouldn't it be nice to not have to slag a reheat furnace? Wouldn't it be nice to weld these billets together? All these are valid points that we dreamed of when I started 25 years ago. And in 2010 things changed. The first Micro-mill was placed into production in the US, and in the fall of 2013, the IRD went to Mesa to see the first micro-mill in operation.

In 2016 the next micro-mill build started and this one also had something new. A spooler. The first in the US followed by 6 more micro-mills with spoolers and another first, a mill producing merchant bar and slitting rebar.

With all the innovations, the big push the last few years has been getting people off the mill floor. No more burning the mill. No one past the local control stations. No tightening the boxes on the bar. Section sizes must be done without touching the bar. As of now we only have 1 crop at the start of cast, and we measure it. That's only 1 bar.
Section size, and first bar on the bed in spec. That's our challenge. So how do we get people off the floor at a micro-mill? That is also a challenge.

- Some of the newer mills come with a test stand where you can check all the systems of a cartridge stand along with getting the stand “RIGHT” before it goes in the mill.
- Our team thought that we could have the biggest impact on safety by making a test stand. A test stand from a vendor was quoted upwards of 250K-500K.
- We built our own with the help of some of our machine shops. Rail or H-beam to raise the stand off the floor. That’s the easy part. Now we can get our critical measurements. Spindle location, staubli location, and roll parting gearbox location.



Now we have a foot print. A base for the stand and height locations for everything else that would be needed. What will we need?

We want to be able to take our new stands, plug them into the mill and, for rebar, come back with first bar on the bed that is 4.5% light. What will we need to accomplish this?

1. Ability to open and close the gap.
2. Ability to turn a roll.
3. Connections for Air, Oil, and Water.
4. Hydraulics to make everything work.
5. Pendant controls.
6. Hydraulic cylinder to move the stand.
7. Air oil pump unit.

- We next had to tie into our hydraulic system so we could operate our Danfoos hydraulic motors to open the roll gap and turn a roll. We then worked on getting our heights right for the gear box and roll spade. Then came making a coupling box.

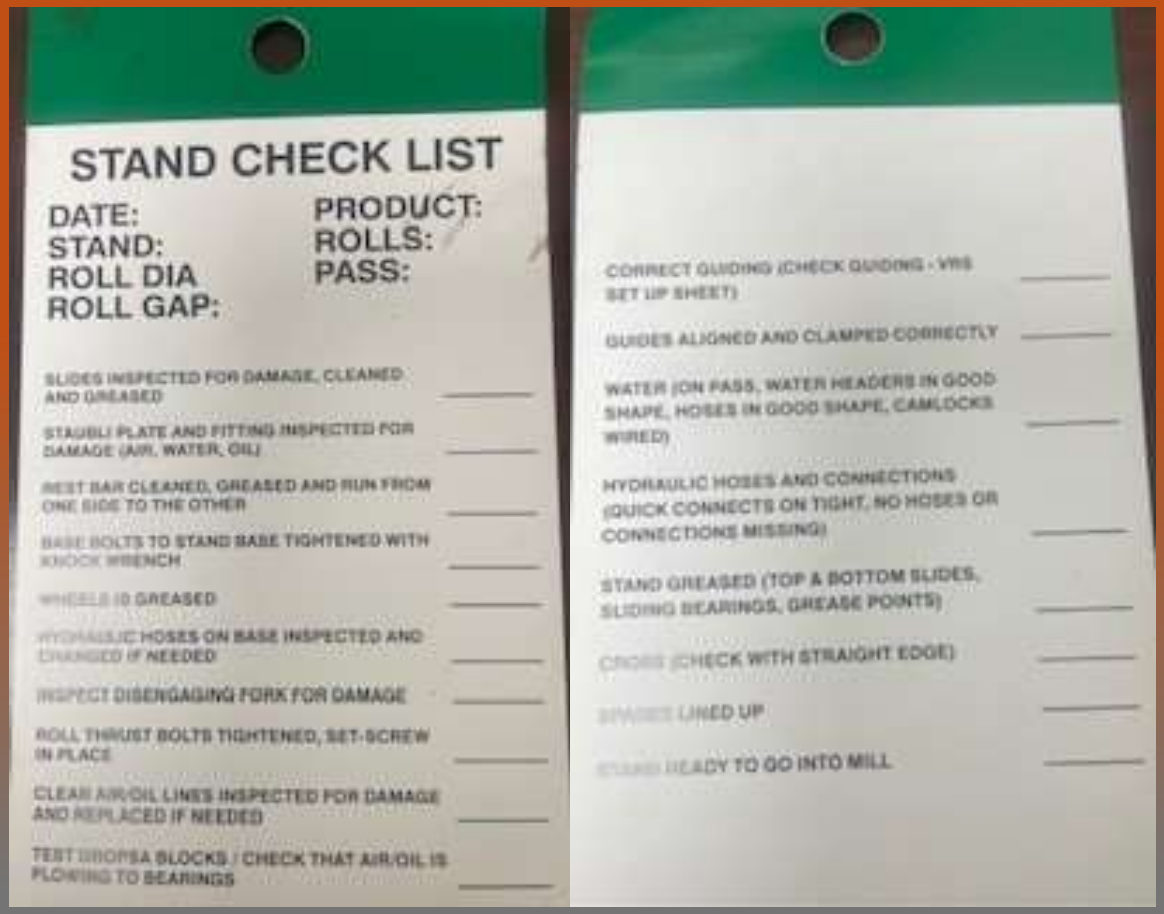
Alignment of the motors to the gearbox and spindles are critical. Remember not to make the coupling box rigid, it must float with the roll parting.

With the stand in place and everything at the proper height we can now align the rolls to the spade, extend the cylinder out to the stand and pull it into the Danfoos motor, staubli plate, roll coupling, and roll adjustment gearbox.




The Air/Oil unit is one of the most cost saving pieces of equipment to use. Verifying that the Air/Oil system is working the way it should eliminates the cost of downtime and replacing bearings and having chocks repaired or replaced.

After hooking up the oil, the air, and the water you can verify that all the critical lubrication and cooling functions are working on the stand. After checking those systems, we then check the roll parting on both sides and make them equal.



Prep work is so important and to verify that the work is audited we fill out our checklist and the stand is ready to go in the mill.

At a total cost of less than 100K, we have taken care of what we can control, and we are ready to bring on cast.

Now what challenges do we have?

All of this prep work is important because if everything goes right, you may run 40-50 heats at 50 tons per heat before the caster shuts down again. That is a billet that is measured by miles, not by a number.

Remember that the caster speed dictates your mill speeds, and the mill controls that speed. The mill still controls the tension between the stands, but caster speed and mill finish speed work together. Communication between the two departments is crucial. You can only go as fast as your bottleneck.

You may be running at 200 inches per minute off the caster with a mill finish speed of 1840 ft/min. Then creep up to 315 inches per minute off the caster with a finish speed of 2895 ft/min.

1. Where is your metallurgical length?
2. What do these changes do to your bar length?
3. What do you need to do with your quench and temper system?
4. What do you do if there is a cobble?
5. On our mill, shear 1 takes a head crop and goes into stand 9. What are the challenges if you must change that pass or any other passes ?
6. How has wear changed on mill rolls?
7. How does speed changes affect roll wear?
8. What innovations are being brought about because of micro-mill?

All these questions and more are what we hope to answer in this work group in the future. Improvement, innovation, and a drive for excellence is what this group is striving for.

Are there any questions?