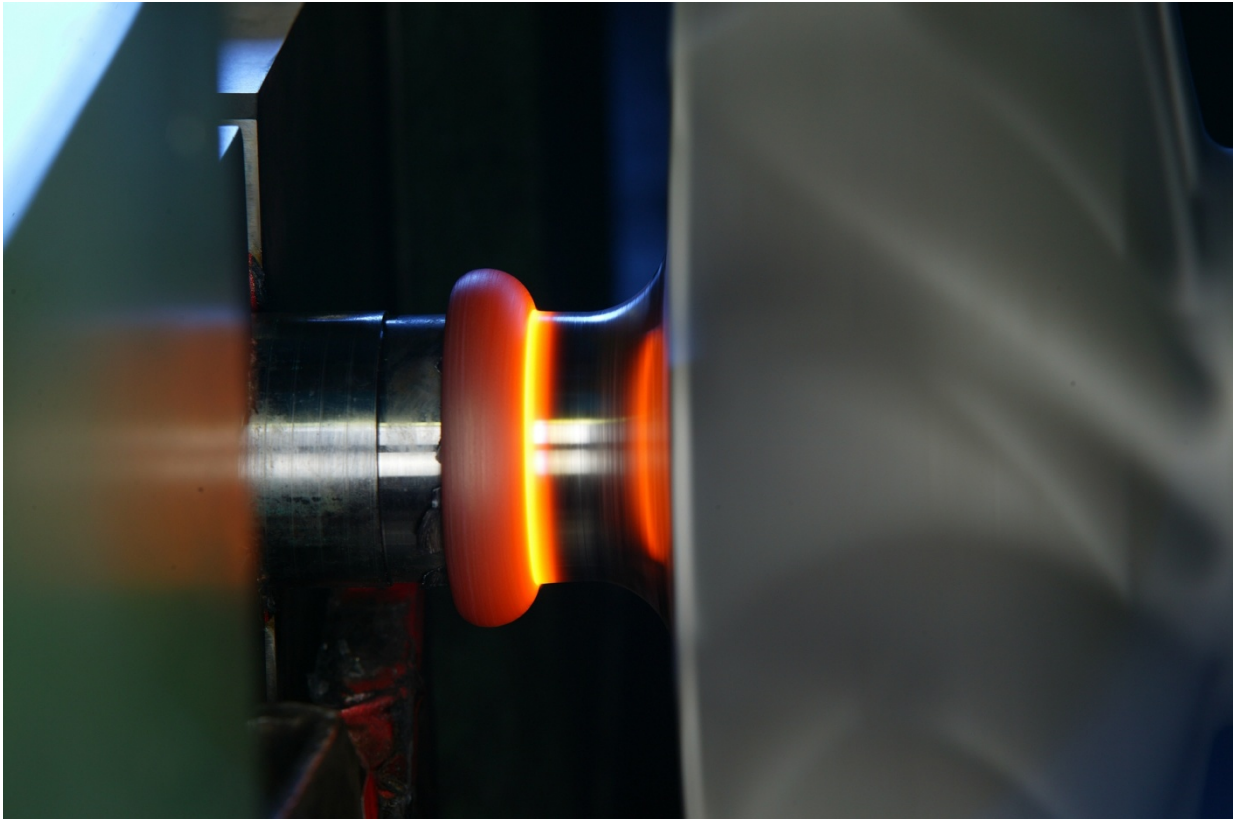




NCCM MILL ROLL FRICTION VS RUBBER FRICTION

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THE PROBLEM

When using mill rolls in steel processing or automotive, often times one of the most notable problems is the lack of surface friction. Not having enough friction can result in quality costs of material, efficiency loss and can add to machine expenses. It is an absolutely crucial part of many mill processes and if not controlled properly, can add insurmountable cost to almost any metal processing line. While rubber has a high coefficient of friction (CoF) when the surface is dry, the friction is drastically reduced when any sort of fluid is added. Lowered friction while running can cause:

- Slipping of the roll on the strip
- Quality defects
- Higher and uncontrollable film thickness
- Lowered machine efficiency
- Additional machine and processing costs
- Labor costs from change over and maintenance
- Higher energy usage

Every one of these problems and more can occur when the friction has been reduced or compromised. When any of these problems occur, money must be invested that otherwise could be used on more appropriate avenues, like new equipment or process upgrades. Friction is an important, almost crucial quality of steel processing rolls and should be treated as such. **Rubber** just doesn't make the cut when it comes to friction.

THE SOLUTION

NCCM Mill Rolls have been proven to have a higher coefficient of friction than rubber in both water and oil applications experimentally, and have been field tested as a superior solution to the rubber roll. Why is friction so important for processing lines? Some applications that require a good amount of friction include:

- Tension for line tightness
- Tension for steering
- Driving friction
- Wringing effectiveness
- Effective wrapping

There are many more things but it is obvious the benefits of having high friction. Immediate cost savings can be seen from friction in a few ways; the first way is through the benefit of driving friction and wringing effectiveness as these two go hand in hand. With rubber rolls using a lubricant, often times there are problems with hydroplaning. This hydroplaning causes poor wringing, quality costs of the material, and it driving friction problems. When a roll starts to hydroplane, it is no longer rolling but sliding, this often requires the installation of a motor to keep the roll turning. NCCM rolls often times eliminate the need for a driving motor as the friction is so much higher. The reason for this is that the movement of the strip is all that is required for driving force so there is no need to mechanize the turning of the roll. If you calculate the cost savings of one motor and multiply that by the number of motors needed the saving due to lowered energy usage then add in the cost savings on quality of material due to the superior wringing, you'll see that installing NCCM rolls is a no brainer.

THE EVIDENCE

The preponderance of evidence of NCCM rolls high CoF can be presented in two ways. First, accounts of people using the rolls with success in various applications for various reasons. Second, experimental evidence conducted either by NCCM or other institutions.

1. Success in the field

NCCM rolls have higher friction on lubricated steel than rubber and urethane. The situation where this is most important is almost always slipping of the strip causing material defects and line inefficiency but the other important thing is the motor removal and energy savings. NCCM had replaced rubber rolls on a line that had slipping problems as many as ten times a month. Each slipping incident caused \$2,500 in material defects. They installed NCCM rolls and have not had slipping problems since. A simple calculation will show that the installation of NCCM rolls saved this company \$300,000/year. This a significant amount of savings ONLY in material quality costs and not including all the other cost savings provided. Again the switch to NCCM rolls should be an easy choice to make to someone who's in the business of saving money.

2. Experimentation

Both NCCM and 3M along with other companies have done extensive testing on the NCCM product to see that it does in fact have a high CoF. Various testing has also been done on rubber rolls to see the results of how different lubricants affect the friction. Some results of this testing are below:

Coefficient of Friction of NCCM rolls vs. Neoprene

Roll Tested	Durometer	Carbon Steel	Aluminum	Stainless	Copper	Nickle
Neoprene Dry	90	0.61	0.29	0.43	0.48	0.2
7N Dry	88.2	0.52	0.29	0.29	0.34	0.34
Neoprene Watered	90	0.18	0.11	0.25	0.22	0.18
7N Watered	88.2	0.4	0.27	0.26	0.31	0.32
Neoprene Oiled	90	0.07	0.08	0.08	0.09	0.09
7N Oiled	88.2	0.36	0.26	0.25	0.28	0.27

Additional testing has been done on just NCCM products tested against them each other. The results are varied but as you can see every product offered by NCCM has a coefficient of friction that is significantly higher than the rubber roll in all the lubricated states and has the same or higher in most of the dry states as well.

	Dry	Wet	Oiled
4CX	0.463	0.421	0.481
4CX+	0.367	0.383	0.372
5N	0.593	0.478	0.435
5N2	0.422	0.316	0.344
5NS	0.881	0.592	0.527
5T	0.536	0.467	0.333
5CX	0.607	0.515	0.403
5CX+	0.427	0.322	0.331
7N	0.490	0.521	0.361
7N2	0.351	0.430	0.372
7NS	0.561	0.640	0.322
7CX	0.429	0.395	0.371
7CX+	0.569	0.486	0.301
9N	0.430	0.389	0.288
9NS	0.572	0.644	0.382

The NCCM product testing that was done against NCCM products was only done on carbon steel. Every product in almost every state with the exception of the dry state, is higher than the rubber alternative. With the test data and the user accounts and success stories it is clear that NCCM product is the right product to choose when it comes to measuring friction, really it is no contest.

CONCLUSION

The results of the product testing shown in this report are not a standard and should only be looked at as qualitative data. While the results and the testing are real and undeniable, friction is a property that is quite variable depending on things like; surface finish, humidity, density, durometer and other things. So while it is certain that NCCM products have a higher CoF, the exact amount varies. Friction is an important part of metal processing and NCCM mill rolls provide higher friction results, cost savings, durability, and an overall superior product and performance. NCCM has testing capabilities for your unique situation that can help maximize your roll results.