Friction of NCCM® Nonwoven Rolls
Kyle Swanson, R&D Tech Supervisor
Published: September 15, 2017
Revised: April 3, 2019
Revision #: 1

THE PROBLEM

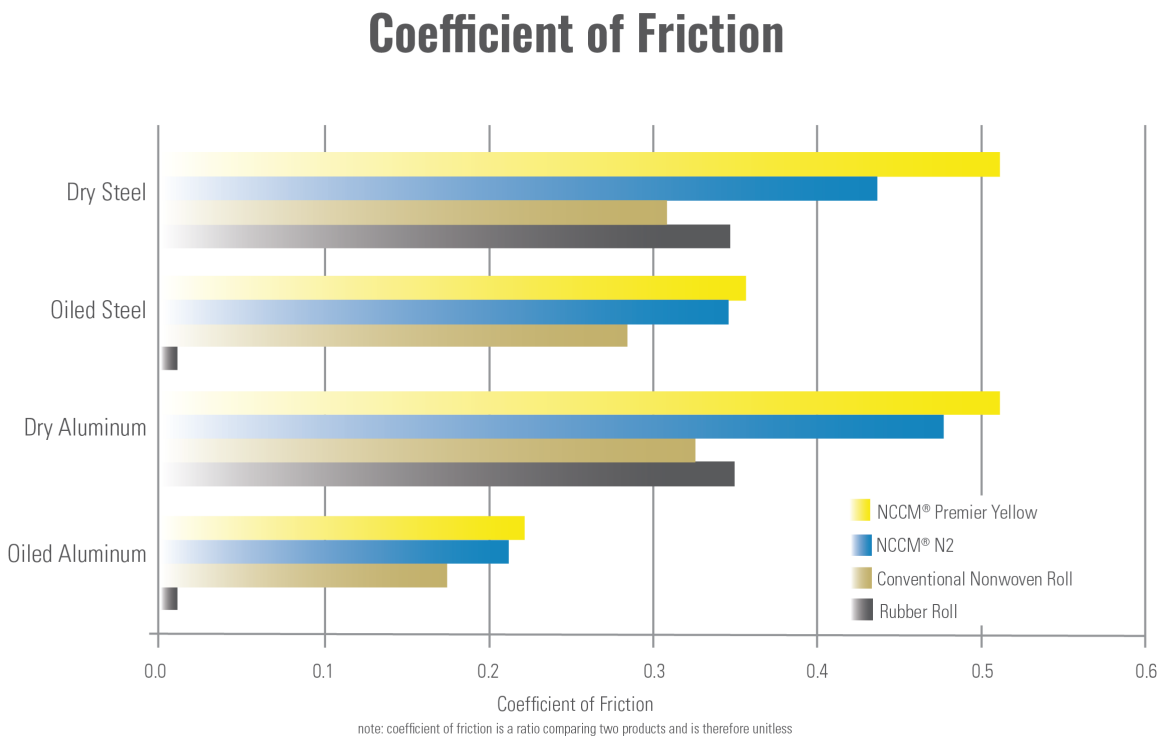
When using mill rolls in steel processing or automotive applications, oftentimes one of the most notable problems is the lack of surface friction. Not having enough friction can result in quality costs of material, efficiency loss and increased machine expenses. Friction is an absolutely crucial part of many mill processes, and if not controlled properly, improper friction can add insurmountable cost to almost any metal processing line. While traditional rolls have 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 the following problems:

- Slipping of the roll on the strip
- Quality defects
- Higher film thickness
- Uncontrollable film thickness
- Lowered machine efficiency
- Additional machine and processing costs
- Labor costs from changeover 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 that could have been used on more appropriate avenues, like new equipment or process upgrades, must be invested in fixing the problem. Friction is an important and crucial quality of rolls used to process steel and should be treated as such. Rubber just doesn't make the cut when it comes to friction.

THE SOLUTION

NCCM® nonwoven rolls have been proven to have a higher coefficient of friction than rubber in both water and oil applications experimentally, and our rolls have been field tested as a superior solution to both rubber and other nonwoven rolls.



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 applications, and it is obvious that there are benefits of high friction. Proper friction can produce immediate cost savings in a few ways. First, proper friction provides the benefit of driving friction and wringing effectiveness. These two go hand in hand. When using traditional rolls and a lubricant, there are oftentimes problems with hydroplaning. This hydroplaning causes poor wringing, quality costs of the material and 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® nonwoven rolls will often eliminate the need for a driving motor due to much higher friction. The reason the motor can be eliminated is because the movement of the strip is all that is required for driving force; there is no need to mechanize the turning of an NCCM® nonwoven roll. If you calculate the cost savings of one motor and multiply that by the number of motors currently needed, add the savings due to lowered energy usage and add the cost savings on quality of material due to the superior wringing, you'll see that installing NCCM® rolls is truly a no-brainer.

THE EVIDENCE

The preponderance of evidence of NCCM® nonwoven rolls' high CoF can be presented in two ways. First, take a look at accounts of people using the rolls with success in various applications for various purposes. Second, examine experimental evidence conducted by NCCM and other institutions.

1. Success in the field

   NCCM® nonwoven rolls have higher friction on lubricated steel than rubber and urethane provide. The situation where this increased friction is most important is almost always when considering the slipping of the strip. This slipping causes material defects and line inefficiency. Another important factor is motor removal and energy savings. NCCM® rolls 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. The company installed NCCM® rolls and have not had slipping problems since. A simple calculation (10 x $2,500 x 12) will show that the installation of NCCM® rolls saved this company $300,000/year. This significant amount of savings only takes into account material quality costs; imagine including all the other cost savings as well. The switch to NCCM® rolls should be an easy choice for someone who's in the business of saving money.

2. Experimentation

NCCM, 3M and 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, and we have tested various NCCM® products against 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 NCCM® nonwoven rolls have the same or higher coefficient of friction in most of the dry states as well.

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

	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

CONCLUSION

The results of the product testing shown in this report are not a standard and should be looked at only as qualitative data. While the results and the testing are real and undeniable, friction is a property that is quite variable depending on things such as surface finish, humidity, density, durometer and other factors. While it is certain that NCCM® products have a higher CoF, the exact amount can vary. Friction is an important part of metal processing, and NCCM® nonwoven rolls provide higher friction results, cost savings, durability, performance and an overall superior product. NCCM has testing capabilities for your unique situation that can help maximize your roll results. Contact us today at sales@nccmco.com or +1 715-425-5885.