OPTIMA
TECHNICAL BULLETIN
Volume X • Number 1

Extending Screen Cylinder Life Through Improved Methods of Industrial Hard Chrome Plating

Developed by the Technical Group, J&L Fiber Services

OVER VIEW

- The hard chroming of screen cylinders can maximize cylinder life and minimize replacement costs associated with cylinder wear.
- Extended cylinder life is directly proportional to the thickness of the hard chrome deposit.
- A new method of hard chrome plating permits heavier deposits, delivering excellent bond strength characteristics – thus further extending cylinder life.
- Both new and reconditioned screen cylinders can benefit from the new chrome deposition process.

In an attempt to prolong screen cylinder life, many manufacturers already routinely chrome plate the feed surfaces of screen cylinders. In theory, the hardness inherent in chrome serves to protect the conventional screen media from the abrasive effects of sand, grit, glass and other contaminants in pulp. When properly deposited on the screen's feed surface, hard chrome plating has been proven to extend screen life anywhere from *50 to over 100%*.

Exploring the Benefits of Chrome

Not long ago, engineers at J&L Fiber Services began exploring the advantages of an exclusive new chrome-plating process. They had two goals in mind. First, to determine the optimum thickness of hard chrome deposits for various mill applications. Second, to identify a method of chrome plating that would provide an even, consistent deposit of chrome across the entire screen cylinder feed surface. This would help overcome the premature wear problems associated with poorly deposited chrome platings – including flaking, chipping and nodular defects.

To determine these parameters, J&L has conducted extensive laboratory and field testing. In the laboratory, an abrasion test was chosen in an effort to duplicate the production atmosphere of mills and evaluate the wear resistance of chrome deposited at different thicknesses.

The abrasion tests consisted of comparing five samples of 316 stainless steel run through an abrasive slurry mixture. Four of the five samples were chrome plated at different thicknesses (See Figure 1). The fifth sample was not chrome plated and used as a control to measure the effect of the abrasives on unprotected surfaces.

Fig. 1

CHROME THICKNESS SPECIFICATION CHART

Specification	Description
T - Thin SP2-0021-09	50 – 127 Microns (.002" – .005") thick with a hardness range of 65 – 75 Rc
C - Standard SP2-0021-03	102 – 229 Microns (.004" – .009") thick with a hardness range of 65 – 75 Rc
H - Heavy SP2-0021-04	254 – 381 Microns (.010" – .015") thick with a hardness range of 65 – 75 Rc
X - Extreme™ Chrome SP2-0021-07	406 – 508 Microns (.016" – .020") thick with a hardness range of 65 – 75 Rc

J&L FIBER SERVICES

All five samples were mounted in the same fixture. The fixture and samples were sealed within a chamber containing specially formulated abrasive slurry, and were then spun within the chamber for a total of 168 hours. Test samples were weighed every four hours to determine the amount of material lost to the abrasive effects of the slurry mixture.

Fig. 2

168-HOUR ABRASION TEST RESULTS

	Starting Weight	Ending Weight	Total Weight Loss
T - Thin	151.638	142.516	9.122
C - Standard	153.225	147.083	6.142
H - Heavy	155.142	151.877	3.265
X - Extreme™ Chrome	158.982	156.963	2.019

A Process that Minimizes Wear and Reduces Costs

The tests proved conclusively that wear resistance is directly proportional to the thickness of hard chrome applied to the base metal. Incremental measurements indicated that thicker chrome deposits delivered longer lasting protection of the base metal. Once the chrome deposit was worn off, wear accelerated dramatically, and significant material loss in each of the samples was noted. The graph in Figure 3 indicates how much weight each sample lost during each of the 42 four-hour tests.

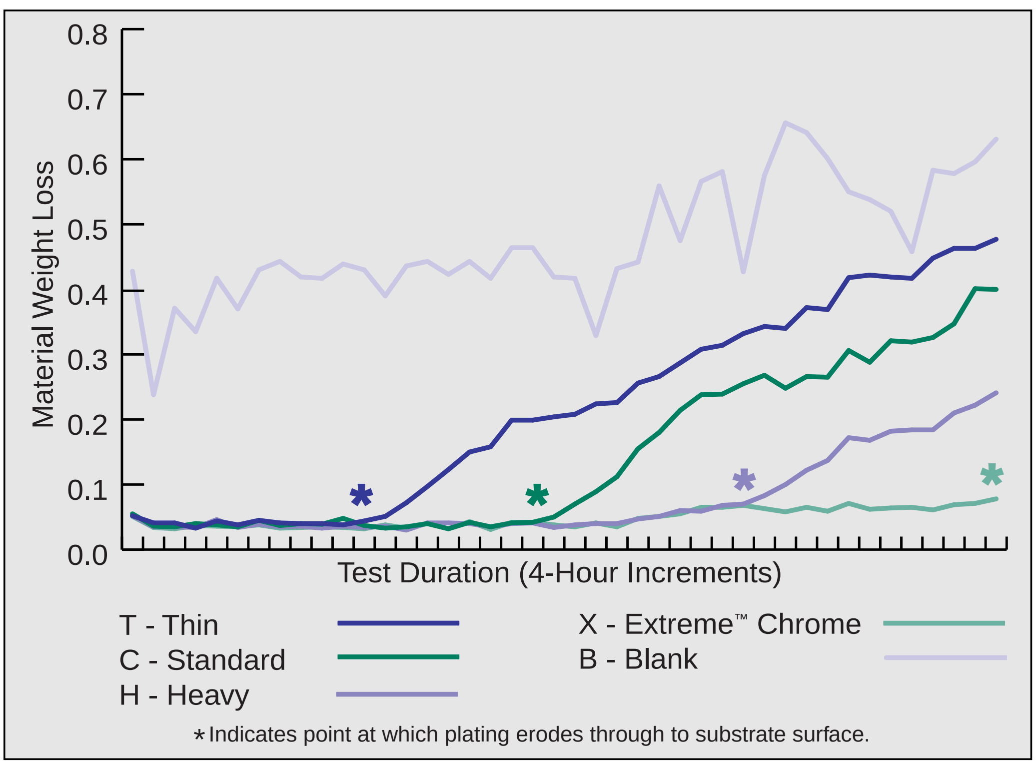
The tests also demonstrated that the chroming process employed by J&L is a superior method of depositing industrial hard chrome to screen cylinders.

Until recently, methods of chrome deposition across the surface of the screen contour were inconsistent. Given the nature of conventional chrome-plating processes, chrome was often deposited on the screen media unevenly. This resulted in thin spots that would wear prematurely and non-uniformly. It also resulted in poor adhesion of the chrome to the screen, leading to premature erosion and abrasion of the hard chrome plating. Loss of the deposited chrome further exacerbated uneven wear across the screen surface.

J&L engineers began exploring alternative methods of chrome deposition. They discovered a process that resulted in a more even deposition of hard chrome to the screening substrate media and better bonding of chrome to the screening substrate surface. J&L engineers also developed a unique method of surface preparation to enhance plating quality.

The result of their research was a process superior to previous methods of heavy chrome deposition. It enabled J&L to apply the thickest (406-508 Microns) and smoothest plating in the industry *without* negatively affecting

Fig. 3: 168-hour abrasion test results



Five samples of 316 stainless steel were subjected to a 168-hour wear abrasion test. Four of the five samples were hard chrome plated at different thicknesses. The fifth sample was not chrome plated and used as a control to measure the effect of the abrasives on standard material. Material loss for each of the samples was measured every four hours. The graph indicates the amount of weight lost in each of the 42 four-hour segments of the trial.

slot width. The process also safeguarded surface quality and minimized surface flaws such as nodules and blistering, and enhanced resistance to chipping and flaking, ensuring longer screen life in virtually any screening application.

Metallography photographs in Figures 4 through 7 depict magnified profiles of chrome deposits over substrate

Fig. 4: Extreme™ Chrome (406 - 508 Microns)
Chrome thickness is .019" (.48 mm) and the Rockwell Hardness is 74.0 Rc.

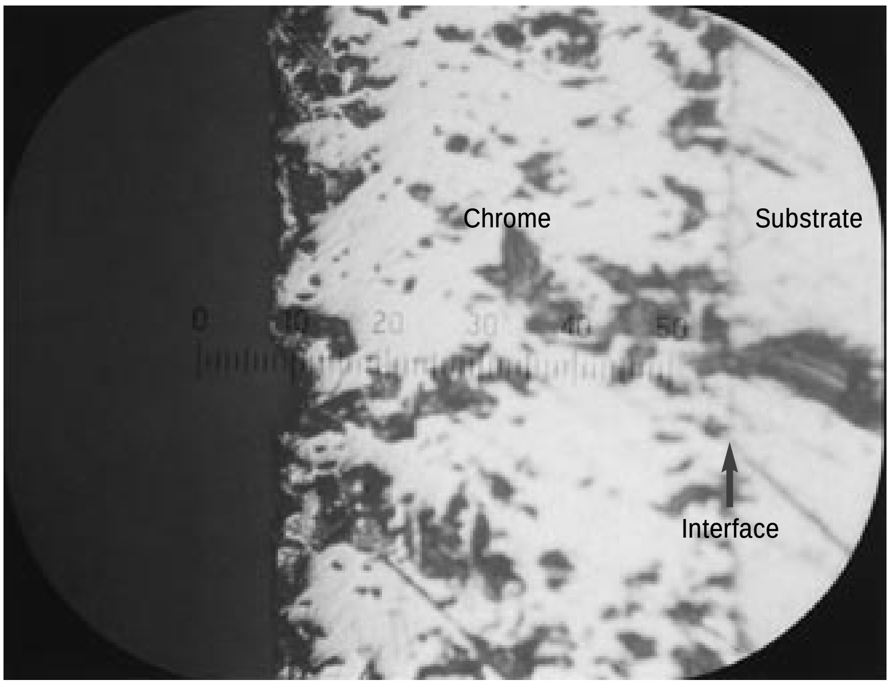
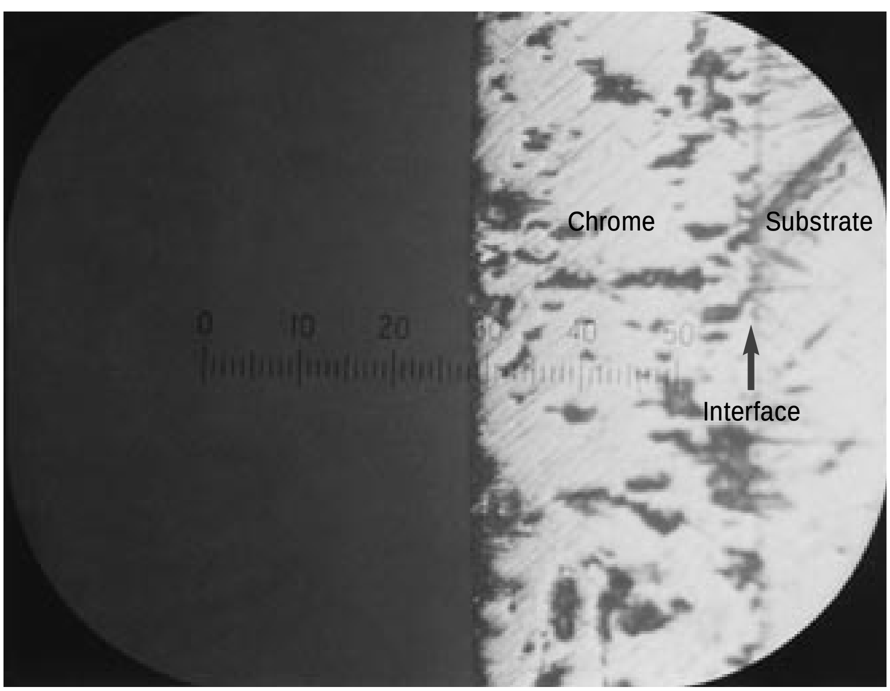


Fig. 5: Heavy (254 - 381 Microns)
Chrome thickness is .012" (.30 mm) and the Rockwell Hardness is 70.0 Rc.



Recommended for New and Reconditioned Cylinders

As results from the wear/abrasion test indicate, chrome deposits can significantly extend the duty life for individual screen cylinders. However, once chrome wears too thin, the substrate metal wear can be significant. Corresponding contour wear will also lead to a dramatic loss of screen cylinder capacity – especially toward the "reject" end of the cylinder.

J&L can help individual mill operators identify the useful life of each cylinder in their application, as well as the problems associated with contour wear and capacity loss. Once those parameters are determined, J&L can help mill operators develop a policy of regular cylinder chrome reconditioning to keep screen performance at optimal levels and reduce cylinder replacement costs.

For best results, cylinders need to be re-chromed just as the original chrome begins to wear through. This way, the feed surface contour shape of the base metal is not worn away. If a proper maintenance schedule is developed and maintained, screen cylinders can be re-chromed up to 3-4 times.

A Process that Can Quickly Pay for Itself

How much can superior hard chroming save a mill? Obviously, that depends on the size and throughput of the individual mill operation. However, examples from our field trial provide a rough indication of the potential savings resulting from advanced methods of chrome plating.

The cost of the chroming process depends on the amount of chrome deposited on the feed surface. For example, costs for an 18" cylinder can range from $500(US) per cylinder for a standard chrome deposit to $2,000 for a thicker deposit. Each mill must evaluate applications individually to determine which level of chrome thickness is best for their individual line or mill applications.

However, these costs are significantly less than the cost of purchasing a new

Fig. 6: Standard (102 - 229 Microns)
Chrome thickness is .009" (.23 mm) and the Rockwell Hardness is 70.0 Rc.

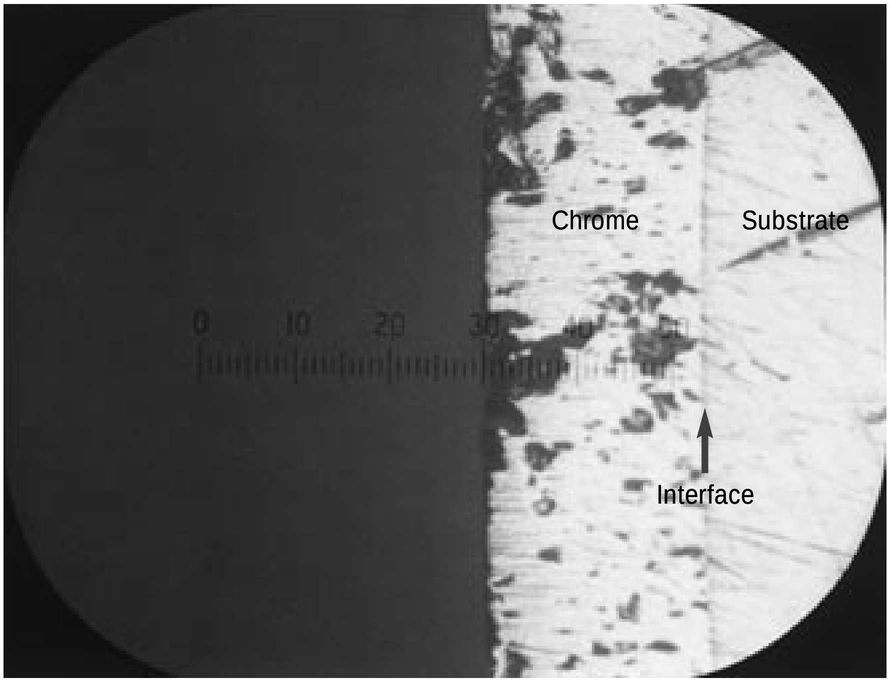
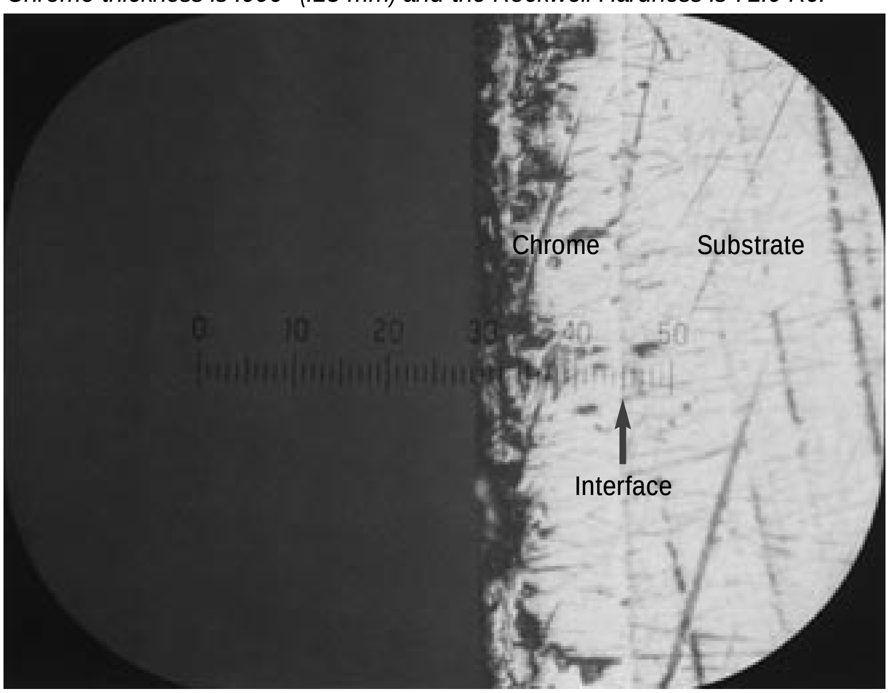


Fig. 7: Thin (50 - 127 Microns)
Chrome thickness is .006" (.15 mm) and the Rockwell Hardness is 71.0 Rc.



cylinder. One of the mills in our field trial routinely went through 12 cylinders a year due to excessive contour wear which significantly reduced screening capacity.

The mill had been using a competitor's chrome-plated cylinders. After inspecting the worn cylinders, J&L field engineers advised the mill operators to install cylinders coated with our Extreme™ Chrome. Based on this suggestion, the mill discovered that the screen cylinders protected with the Extreme Chrome lasted twice as long, cutting cylinder consumption in half.

The mill's additional investment in the Extreme™ Chrome process for all of the cylinders in this application was $7,200 above the cost of the chrome process it had previously used. However, the process helped the mill cut its cylinder consumption in half. At a cost of approximately $12,000 per cylinder, the chroming process helped the mill realize a savings of $72,000 – less the $7,200 cost of the chrome – in one year alone.

J&L engineers can help your company determine the optimum levels of chrome plating your mill requires.

Conclusion

The practice of applying chrome to screen cylinders significantly extends screen cylinder life – especially in the abrasive environments found in many screen cylinder applications. Recent tests prove that the extended life of a cylinder is directly proportional to the thickness of the chrome deposit. Furthermore, new methods of chrome deposition used by J&L Fiber Services can eliminate coating defects such as chrome chipping and flaking, ensuring the integrity of the chrome deposit and further extending the life of both new and reconditioned cylinders.

J&L FIBER SERVICES
A PRECISION CASTPARTS COMPANY

J&L Fiber Services, Inc. • 809 Philip Drive • Waukesha, WI 53186 USA • Phone 262-544-1890 • Fax 262-547-8166