



ELISHA ENGINEERED SURFACES™

Summary of Torque Tension Data Zinc Yellow Chromate VS. Zinc Elisha EMC™

Abstract

The objective of this testing was to obtain a torque tension comparison between Wilson Garner M10 bolts coated with zinc and yellow chromate and zinc and Elisha's Mineral Coating (EMC™). Torque tension is used to predict repeatable clamp force and is a critical characteristic for many fasteners. The data showed that there was less friction on the bolts coated with the Elisha EMC™ than the ones coated with yellow chromate. Additional testing is planned and underway.

Experimental Method

All experiments were performed in accordance to test protocol USCAR-11. The experiments were done with an RS Technologies torque tension machine at Magni Industries. Eight samples of each of the two coating were subjected to forces ranging from 20,000 to 42,300 Newtons.

Results

A comparison of the torque tension data for the samples with zinc with a yellow chromate and those coated with zinc and Elisha EMC™ is given in Figure 1. This data is also presented in Table 3 in the Appendix.

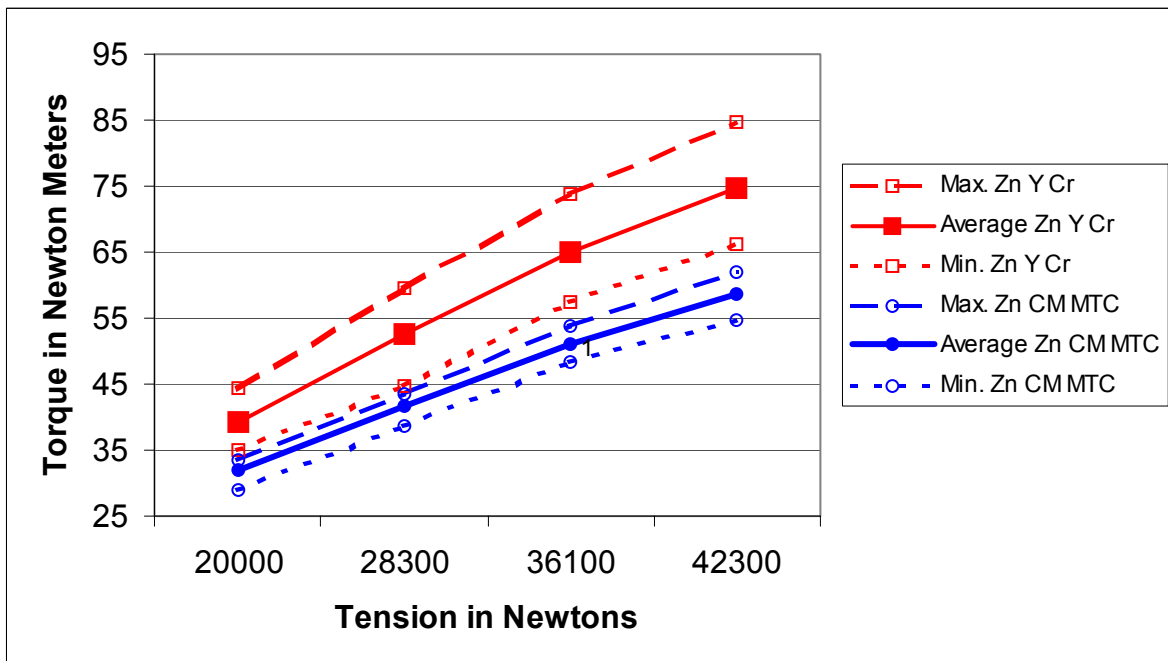


Figure 1 – Torque vs. Tension Comparison for Yellow Chromate and Elisha EMC™

The standard deviation for the peak torque for the zinc yellow chromate treatment was 5.57 Nm with a three-sigma range of 33.4, and was 2.56 Nm with a three-sigma range of 15.4 for the zinc Elisha EMC™.

Conclusions

The lower values of torque for the Elisha EMC™ treated bolts indicate that there is less friction on the Elisha surface than the yellow chromate surface. Since the three-sigma range for the Elisha mineral is smaller than that for the yellow chromate, the Elisha surface allows for a more reproducible torque tension relationship than the yellow chromate. Additional work must be performed in order to quantify the coefficient of friction for the Elisha surface, as well as to evaluate the impact of lubrication materials.

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To learn what Elisha EMC™ and Elisha's other surface engineering and corrosion solutions can do for you, contact Nancy Heimann at 1-888-354-7422 or see www.elisha.com.

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Appendix

Table 1 – Tension and Torque Data for Zinc Yellow Chromate

Sample #	Force Values (Newtons)				Torque (Newton meters)
	20000	28300	36100	42300	
1	41.3	55.4	67.1	75.8	
2	40.2	54.1	66.9	77.2	
3	44.3	59.6	73.8	84.6	
4	40.8	53.5	65.6	74.5	
5	34.9	44.6	57.3	66.3	
6	35.6	48.0	59.3	68.5	
7	39.6	53.0	65.1	74.1	
8	38.3	52.1	65.5	76.3	

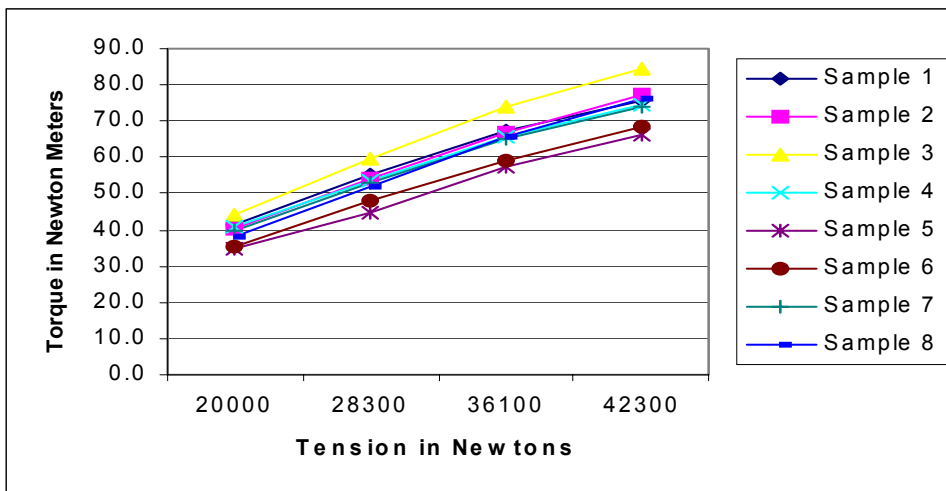


Figure 1 – Graphical Representation of the Data in Table 1

Table 2 – Tension and Torque Data for Zinc Elisha EMC™

Sample #	Force Values (Newtons)				Torque (Newton meters)
	20000	28300	36100	42300	
1	28.9	38.6	48.2	55.8	
2	30.8	40.5	49.4	57.1	
3	32.7	43.5	53.9	62.1	
4	31.1	41.7	52.1	60.1	
5	33.4	43.6	52.3	58.8	
6	32.2	43	52.9	60.7	
7	32.1	42.1	51.6	59.5	
8	33.6	41.5	48.9	54.6	

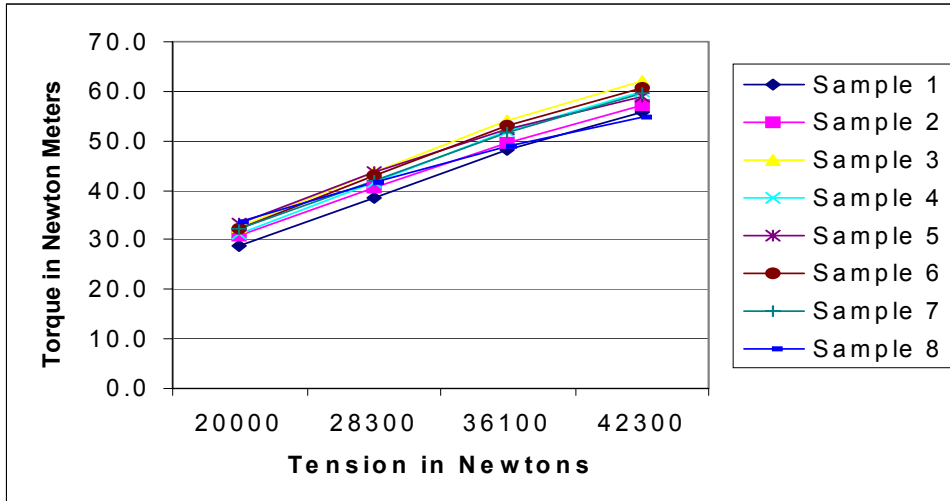


Figure 2 – Graphical Representation of the Data in Table 2

Table 3 – Torque and Tension Comparison between Yellow Chromate and Elisha EMC™

Sample group	Force Values (Newtons)				Torque (Newton meters)
	20000	28300	36100	42300	
Max. Zinc Yellow Chromate	44.3	59.6	73.8	84.6	
Average Zinc Yellow Chromate	39.4	52.5	65.1	74.7	
Min. Zinc Yellow Chromate	34.9	44.6	57.3	66.3	
Max. Zinc Elisha EMC™	33.6	43.6	53.9	62.1	
Average Zinc Elisha EMC™	31.9	41.8	51.2	58.6	
Min. Zinc Elisha EMC™	28.9	38.6	48.2	54.6	