



CHEMEON AA-200 (Anodizing Additive)

Technical Benefits

(formerly Metalast AA-200)

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AA-200 Benefits Overview

- Used in Type II (sulfuric) and Type III (hardcoat) anodizing
- Meets or exceeds ALL major anodizing specifications
 - MIL-A-8625F for corrosion and abrasion resistance
- Provides improved consistency and oxide uniformity
- Improved resistance to burning, especially on difficult to anodize alloys (2024)
- Ability to operate as higher current density
- Reduces cracking and crazing



AA-200 Benefits Overview

- Improves processing efficiency
 - Reduces chemical dissolution rates
- Provides superior quality
 - Smoothness and lubricity
- Reduces operating costs
- Requires much lower operating concentration than other additives
- Does not produce significant “sludge” build-up



AA-200 Benefits

Corrosion Resistance- Test Data

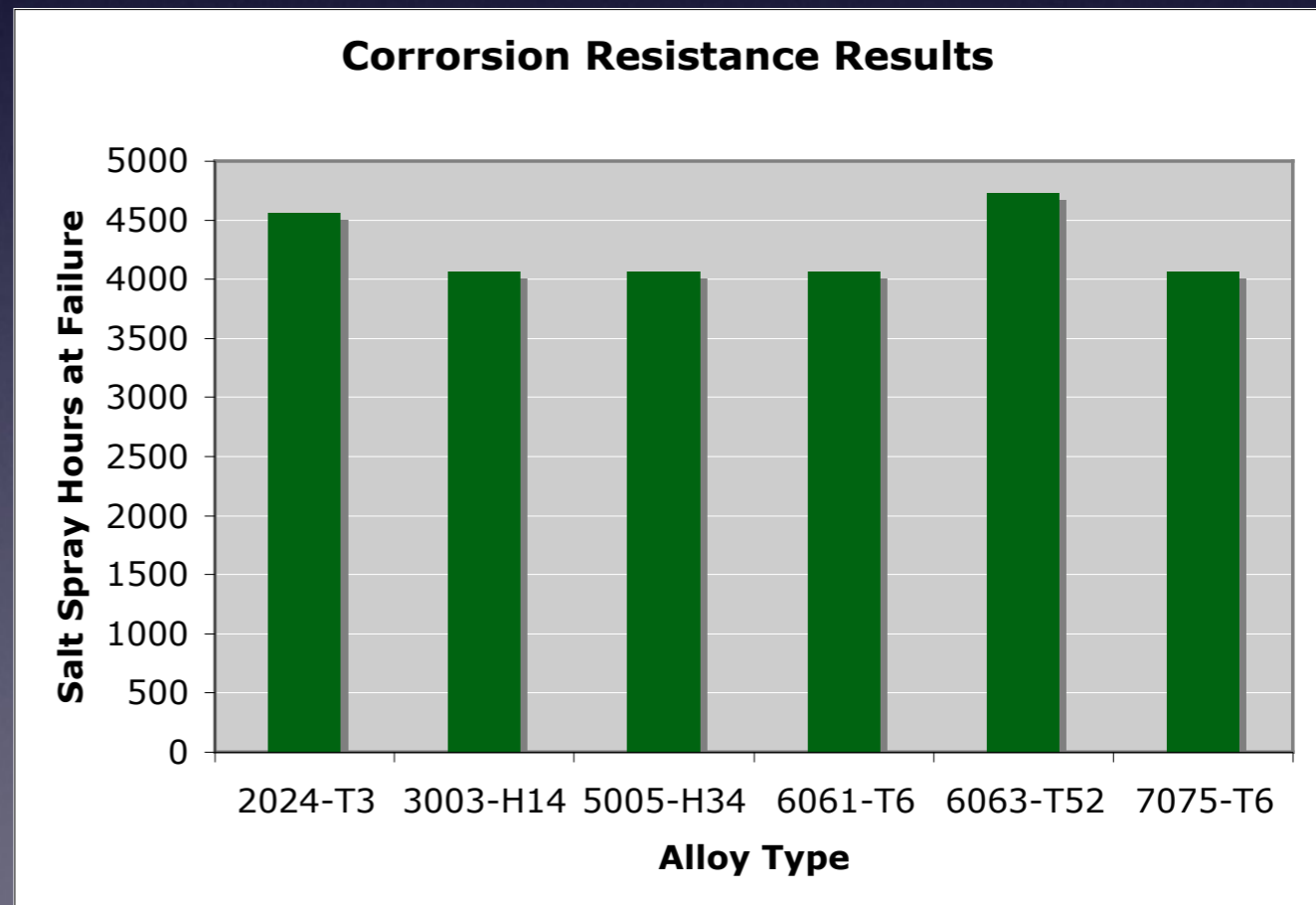
- Anodized parts to meet MIL-A-8625F (corrosion resistance)
 - 336 hours salt spray testing
 - Ten (10) coupons representing six (6) alloys tested
 - 2024 T3, 3003 H14, 5005 H34, 6061 T6, 6063 T52, 7075 T6
 - All panels were run in Type II anodize with nickel acetate seal
 - All panels were process and tested at the CHEMEON Technical Center



AA-200 Benefits

Corrosion Resistance- Test Data Results

- All panels successfully passed 4,000 hrs in salt spray
- **Note: panels processed in Type II environment using CHEMEON TCP-HF anodizing seal successfully passed 7,000 hrs in salt spray*





AA-200 Benefits

Wear/Abrasion Resistance- Test Data

- Type III anodized parts to meet MIL-A-8625F (abrasion resistance)
- Measured using a Taber Abrasion Test
- Experiments were performed on twelve (12) coupons, representing three (3) alloys
 - 6061 T6, 7075 T6, 2024 T3
 - All panels were process and tested at the CHEMEON Technical Center



AA-200 Benefits

Wear/Abrasion Resistance- Test Data Results

- Results are in mg/1,000 cycles
- *Conclusion: AA-200 provides excellent wear resistance which greatly exceeds the requirements of MIL-A-8625F*

ALLOY	Measured Wear Index	Max Allowable Wear Index (MIL-A-8625F)
6061-T6	0.89	1.5
7075-T6	0.65	1.5
2024-T3	1.22	3.5



AA-200 Benefits

Microhardness- Test Data Results

Alloy	Current Density (A/ft ²)	Average Vickers Microhardness (Hv)	ISO 10074 Acceptance Value for Vickers Microhardness (Hv)
2024-T3	30	336 (24)	250
2024-T3	24	347 (28)	250
7075-T6	30	346 (19)	300
7075-T6	24	370 (25)	300
6061-T6	30	405 (3)	400
6061-T6	24	407 (3)	400



AA-200 Benefits

Breakdown Voltage- Test Data Results

- Sealed in hot deionized water

Average Oxide Thickness (μm)	Sealed/Unsealed	Average Breakdown Voltage (Vdc)	Average Breakdown Voltage per Micron ($\text{V}/\mu\text{m}$)
49.7	Unsealed	2080 (230)	41.9 (4.6)
50.9	Sealed	2630 (260)	51.7 (5.2)
73.2	Unsealed	4050 (300)	55.3 (4.0)
73.5	Sealed	4110 (60)	55.9 (1.5)
92.3	Unsealed	4240 (370)	45.9 (4.0)
90.1	Sealed	4740 (120)	52.6 (1.4)



AA-200 Benefits

Coating Weight and Conversion Efficiency-Explained

- The higher the conversion efficiency, the better the performance of the anodizing process
- MIL-A-8625F requires at least:
 - Type II anodize- 1000 mg/ft²
 - Type III anodize- 4320 mg/ft²



AA-200 Benefits

Coating Weight and Conversion Efficiency - Test Data Results

- *Conclusion: The coating weights produced with AA-200 greatly exceed the requirements of MIL-A-8625F*

Anodizing Type	Alloy	W_c (mg/ft ²)	Conversion Efficiency (%)
II	1100-H14	4577	82.8
II	2024-T3	3252	53.4
II	6061-T6	4122	80.6
II	7075-T6	3828	79.2
III	1100-H14	8724	94.6
III	2024-T3	7759	82.9
III	6061-T6	8232	92.6
III	7075-T6	8000	97.3



AA-200 Benefits

Surface Roughness - Test Data

- Various alloys processed with AA-200
- The surface roughness was measured before and after anodizing several different alloys
- Test data results are given in micron before and after anodize
- Surface roughness of typical “conventional” Type III anodize usually increases by more than 10-20 micron



AA-200 Benefits

Surface Roughness- Test Data Results

Anodizing Type	Alloy	Base metal surface roughness Long/Trans.	Coating surface roughness Long/Trans
MLT - II	1100 - O	4.1 / 6.9	5.5 / 7.3
MLT - II	2024 - T3	16.8 / 20.8	17.7 / 22.6
MLT - II	3003 - H14	10.6 / 16.4	13.9 / 16.9
MLT - II	5052 - H32	6.8 / 14.7	10.4 / 14.4
MLT - II	6061 - T6	7.8 / 14.4	14.2 / 18.8
MLT - II	7075 - T6	12.1 / 20.8	15.4 / 20.9
MLT - III	1100 - O	4.1 / 6.9	13.7 / 16.1
MLT - III	2024 - T3	16.8 / 20.8	21.9 / 29.7
MLT - III	3003 - H14	10.6 / 16.4	27.4 / 30.7
MLT - III	5052 - H32	6.8 / 14.7	16.2 / 24.5
MLT - III	6061 - T6	7.8 / 14.4	21.3 / 29.1
MLT - III	7075 - T6	12.1 / 20.8	21.7 / 32.5



AA-200 Benefits

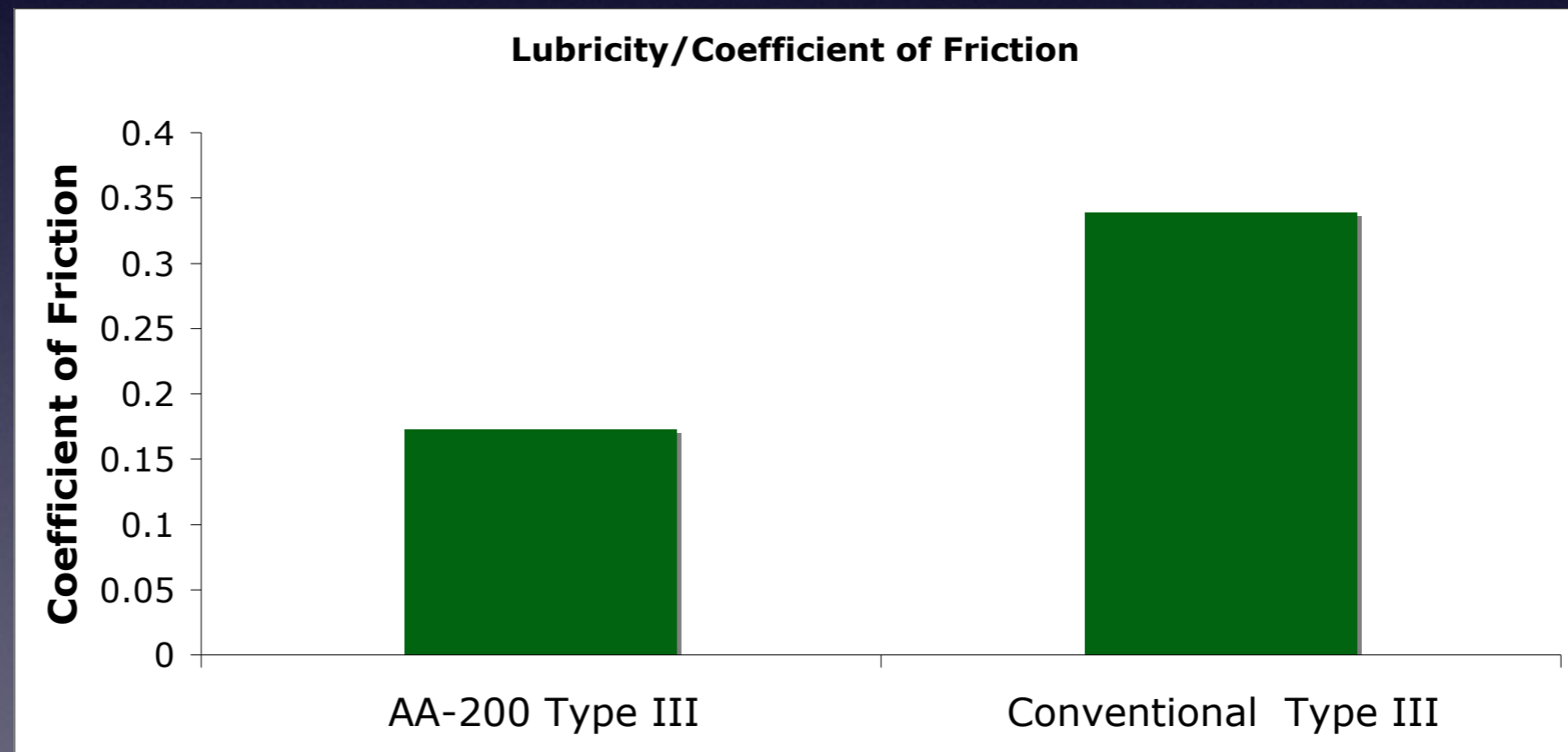
Surface Roughness- Test Data Results

- **Conclusions:**
 - The surface roughness of the anodic coating for Type II increased slightly
 - The surface roughness of the anodic coating for Type III increased by 10-15 micron
 - The surface roughness increases LESS with AA-200
 - 10-15 micron WITH AA-200
 - 10-20 micron with conventional products



AA-200 Benefits Lubrlicity- Test Data Results

- *Conclusion: The coating produced with AA-200 is more lubricious/ smooth than conventional coatings*





AA-200 Benefits

Uniformity of Oxide- Test Data/Results

- The Coefficient of Variation (COV) of the weight loss of aluminum consumption is used to assess the uniformity of anodic coatings formed
- The COV of the weight loss of aluminum consumption was determined for four (4) different alloys in two (2) different anodizing tanks, one (1) with AA-200 and one (1) without AA-200
- The four (4) samples processed with AA-200 show much lower COV
- **Conclusion:** AA-200 will improve the uniformity of the anodic oxide



AA-200 Benefits

Chemical Dissolution Rate- Test Data/Results

- The chemical dissolution rate determines the “lifetime” of an anodizing tank
- Studies show that AA-200 reduces the dissolution rate of anodic coatings by 15%-33% (depending on alloys processed)
- **Conclusion:** AA-200 increases the lifetime of an anodizing tank by reducing the build-up of aluminum ions, reducing the number of annual tank “dumps” and “decants”



AA-200 Benefits Reduction of Operating Costs

- AA-200 only requires 0.4% (Type II) and 0.8% (Type III) operating concentrations
- Typical additives require 10 TIMES higher concentrations, 4%-8%
- AA-200 consumption is ~two (2) to six (6) gallons/month for a 1,000 gallon tank
- This will vary based on throughput and dragout



AA-200 Benefits

Process Capability Index (C_{pk})

- Index used to assess the consistency, reproducibility, reliability and stability of given process
- ISO 9000 and QS 9000 require at least C_{pk} of 1.33
- AA-200 and CHEMEON process control computer yield a C_{pk} of 2.54



AA-200 Benefits

Ability to Operate at Higher Current Density

- Ability to run “higher than conventional” current density
 - Shorter anodizing run time
 - Increased production and throughput
- Improved resistance to burning and “edge effect”



AA-200 Benefits Conclusions

- Technically superior to other conventional additives or just sulfuric chemistry
- Meets or exceeds all of the specifications in MIL-A-8625F
- Provides a more uniform oxide
- Operates at lower concentrations and lower overall chemistry costs
- Operates at higher current densities while minimizing burning and increasing throughput



AA-200 Benefits Conclusions

- Increased abrasion resistance (exceeding requirements of MIL-A-8625F)
- Increased corrosion resistance (exceeding requirements of MIL-A-8625F)
- Provides a smoother surface and lowers rejects rate
- Increases the life of anodizing tank (decreases dump/decant frequency)



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