



55 Maryland Avenue., Pawtucket, RI 02860
Tel. (401) 728-7081 Fax (401) 722-1720

12" x 24" Barrels New System

Dear Mike,

In response to your request for a revised Quotation, Technic, Inc. is pleased to submit the following revision for the ***Brass Plating System***, for your approval.

**Technic, Inc.
Equipment Division**

Automated Brass Plating System

Technic, Inc./Equipment Division
55 Maryland Avenue, Pawtucket, Rhode Island 02860-6219 USA
Phone: 401 728-7081 FAX: 401 722-1720

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I - Specification

Specifications dated February 17, 2015 plus following calculations and meeting notes.

Barrel Size: 12" x 24"

Heat via: Electric heat 2-4 hour heat up time.

Meeting notes of July 10, 2015

ENGINEERING AND LABOR

- Make brass tanks all one solution by adding interconnecting plumbing and recirculation pump besides the two (2) filters. **This adds \$3,000.00**
1. Rinse tanks: Client wants conductivity controls, plus PLC controls and flow control with alarms on rinse tanks as sometime they have water flow issues. **This adds \$14,000.00**
2. Sterling barrels but need to address that Client finds the dangles wear through the mesh. (I have an email and call into Alex at Luster-On Products) Luster-On has stated they have no means to add a wear strip in cylinders. I will quote hard wall drilled cylinders.
3. Increase rectifier size to 100 amps 10 volt. **This adds \$5,650.00**
- After Brass plate we need to add a drag out rinse. **This adds \$6,285.00**
4. First rinse after drag out add heat 40°C, 104°F. **This adds \$3,950.00**
5. Add space for future heat to the TCFR tank after Passival 40°C, 104F.
6. Add for future heat in the TCFR in regards to the conduit and wiring from enclosure to junction box on the line. **This adds \$2,150.00**
7. Add cooling coils to brass tanks. **This adds \$11,200.00**
- 8.
- 9.
10. Quote chiller. **This adds \$10,800.00**
11. Wants anode to cathode ration of 2 to 1 so check with Chelsea if we would use slab or baskets. Barrel load will be about 66 sq. ft. Skip said they were switching over to anode baskets. We would need 4 titanium baskets per anode bar total of 72 with bags. **This adds \$9,000.00**
12. Add brass plate tank covers. **This adds \$4,050.00**
13. Add brass makeup tank with heater, mixer and metering pump. They make 7 Lb. adds twice a day. The makeup tank could be 60 gallons. **This adds \$19,115.00**
14. Make the barrel auto positioning for cover removal and dump and set for loading. **This adds \$3,500.00**
15. Quote two (2) 12x12 spin dryer with options. Heat at 55°C or 131°F and want 1,000 rpm. **This adds \$28,600.00**
16. Be more specific on the process specification sheet so it is clearer.
17. Have engineering generate a timeway.

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18. Add PH monitor and metering pump additions to passival tank from a drum. **This adds \$8,950.00**
19. Add amp hour meters to brass tanks with metering pumps from jug. **This adds \$16,800.00**
20. Client wants to move the anode bar with either slabs or baskets from the brass tanks to the rinse tanks after plate. **This adds \$8,000.00**
21. Client wants an estimated spare parts list. **Only after the system is engineered can a detailed spare parts list be generated but as an estimate you can use 3% to 5% maximum. Some items may be long lead and require having a spare but 90% of material is typically available from local sources off the shelf.**
22. Wants a clean water filter with bypass. **This adds \$5,200.00**
23. Add cooling to the Passival tank (heater included previously) for ambient rise over 70F. **This adds \$10,500.00**

Total additional cost to this proposal \$170,750.00 which does not include estimated spare parts.

Meeting notes of August 4, 2015

1. After Brass drag out rinse reduced 4 station rinse to a 3 station rinse.
2. Added a Hot D.I. Final Rinse tank 104°F
3. Relocated heater from triple counterflow rinse to final hot DI rinse.

Meeting notes of August 13, 2015

1. Addition of cyanide copper strike which will add the following:
 - ▶ Sulfuric Acid
 - ▶ Triple Counterflow Rinse
 - ▶ Cyanide Copper
 - ▶ Drag Out Rinse
 - ▶ Counterflow Rinse
 - ▶ Copper Makeup Tank

Client Decision April,

- ▶ Remove Cyanide Copper Strike and associated components that was added August 13, 2015.

Line Currently at 1.8M / 10hr Day					
Constants					
Part Attributes					
Surface/Part	0.2158			in ² /part	**From PRO/E Mode I
Part Weight	0.2792			g/part	
	0.000615			lbs./part	
Vol. Of Parts	9200			parts/liter	
Barrel Load Size					*Estimated
Range	15.25	15.5		lbs.	
Amplifier Settings					
Pcs. Range	24797.6	25204.2		pcs	
	5351.3	5439.1		in ²	
Surface Area Range	37.16	37.77		ft ²	
Voltage	4.7-5.3	4.7-5.3		Rec 1 - Rec 2	
Rectifier	78	78		Amps	
	4	4		Barrels/Rectifier	
	0.52	0.52		A/ft ²	
	0.056	0.056		A/dm ²	
Technic to quote is 3.5M / 10hr Day					
3,500,000 parts / 8 hrs = 437,500 parts per hour.					
Assuming 10 loads per hour (48 min plate time with 9 plating cells = 5.33 min cycle)					
Requires 43,750 parts per barrel					
.006632 cuClient inches per part x 43,750 parts = 290 cuClient inches per load.					
.000615 pounds per part x 43,750 = 26 pounds per load.					
12 x 24 barrel at 1/3rd fill has a 570 cu Client inch capacity or 85,946 parts.					
.2158 Sq. In x 43,750 = 9,441.25 sq in / 144= 65.56 sq ft x .52 ASF = 34.9 amps					

II - Automation

► *Hoist Description MAC 250*

Two (2) Technic Mac-250 cantilevered, side arm hoist designed to travel behind and above the tank line with only the work boom traveling over the open tanks thus decreasing the possibility of bath contamination.

Designed for ease of service and years of operation. The hoist is constructed of structural steel, welded, shot blasted to assure good adhesion, primed, and painted with two-part epoxy.

The following features are included in the hoist design:

- Lifting capacity 250 pounds.
- **Anode bar lifting capacity 300 pounds at reduced lift speed.**
- Lifting boom and automatic pick-ups constructed of type 304 stainless steel.
- Positive rack and pinion horizontal drive system eliminates slipping past stations as experienced on friction drive hoist.
- Heavy duty motor/reducer assemblies, complete with servo drives.
- Servo motors provide speeds of up to 200 FPM.
- Positive roller chain lift assembly.
- Station location via servo encoder.
- All set limits for lifting, lowering, anti-collision, end of track shutdown, and overtravels are via inductive, solid state proximity switches.
- Infrared bath occupied safety system prevents a load from being lowered into an occupied station.
- "RF" hand held unit allows manual control.
-

► *E-Chain Cable Systems*

E-TRACK Umbilical cables. Electrical cable runs inside the E-Track, which rides inside a plastic E-Track tray and runs the length of the line. The system includes entrance glands and terminal junction box. Both ends of the cable are marked with individual wire markers for ease of field installation.

► ***Hoist Support Steel***

One (1) floor support structure designed to support the hoists and e-chain cable systems. The structure is constructed of tubular steel, welded, shot blasted to assure good adhesion, primed, and painted with two-part epoxy. Structure is designed to split into shipping sections, each approximately ten (10) to twenty (20) feet long for ease of handling and reassembling in the field. This structure is approximately 80 feet long. Frame allows for approximately 3' extra travel for future anode service station.

Hoist Control System (Series I)

- At the heart of Technic's automated hoist control systems is an Allen-Bradley programmable controller. The controller, also known as a PLC, is programmed with industry standard ladder logic.
- System includes the PLC, servo drives and all electronic and other components required for operation of the hoists. A lockable main power disconnect, three phase line input fuses, control power transformers, and other associated hardware components are provided.
- Included with the control package are the Allen-Bradley PLC with I/O, I/O Rack, CPU, power supply and a PC based HMI.
- The display will include screens to display hoist status, fault messages, bath temperature, rectifier monitor and control and allow timeway storage and editing of up to 10 timeways.
- One (1) timeway is included. Future timeways can be generated by the end user and entered via the HMI using simple commands.
- If the customer requires Technic Inc to provide additional timeways these will be completed at \$1,250.00 each.
- Travel motions will be controlled by servo drives.
- The hoist positioning system will be via servo encoder.
- Three modes of operation are provided (fully automated, semi-automated, and manual/jog).
- Hoist control software will consist of one (1) timeway with the PLC operating software.

Price

\$212,000.00

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III - Tanks and Accessories

STATION #1 **Load Unload Area**

30" x 38" x 42" high constructed from type structural steel and includes:

- Hot DC rotator saddles.
- Auto position for barrel cover location. After hoist lowers barrel into the load/unload stand the barrel will automatically rotate and position the cover for operator removal. Operator will then press the rotate button and the barrel will rotate for a select amount of time assuring the work is dumped and the barrel will automatically rotate and position the opening for operator to load barrel and replace cover.
- Directional chute.
- Basket removal cart.
- Emergency stop pull cord.

STATION #2 **Hot D.I. Rinse** **104°F**

33" x 38" x 30" constructed from 1" thick stress relieved natural polypropylene and includes:

- Locating saddles with hot DC rotator saddles.
- Overflow weir with outlet.
- Water Inlet ball valves.
- Water solenoid controlled by PLC with adjustable “on time” from the HMI and Dwyer flow meter
- One 1.5" side bottom drain outlet to A/A drain.
- T316 SS heater with over-temp safety.
- Low level safety controller.
- Temperature RTD probe.
- Push / Pull exhaust hoods.

STATION #3-5 Triple Counterflow Rinse

92" x 38" x 30" constructed from 1" thick stress relieved natural polypropylene and includes:

- Locating saddles with hot DC rotator saddles.
- Two (2) sets of over / under flow baffles.
- Overflow weir with outlet.
- Water Inlet ball valves.
- Water solenoid controlled by PLC with adjustable "on time" from the HMI and Dwyer flow meter
- Three 1.5" side bottom drain outlets to A/A drain.
- Sized for future heat in station #3

STATION #6 Passival 75°F

30" x 38" x 30" constructed from 1" thick stress relieved natural polypropylene and includes:

- Locating saddles with hot DC rotator saddles.
- PTFE heater with over-temp safety.
- PTFE cooling coil. (mini chiller in section X)
- Low level safety controller.
- Temperature RTD probe.
- Push / Pull exhaust hood.
- Water Inlet ball valve.
- Ph. monitor and chemical feed system.

STATION #7 Soak Clean 100°F

38" x 38 " x 30 " constructed from 1" thick stress relieved natural polypropylene and includes:

- 6" overflow weir with bottom drain outlet and oil decant spigot.
- Locating saddles with hot DC rotator saddles.
- T304 SS heater with over-temp safety.
- Low level safety controller.
- Temperature RTD probe.
- Push / Pull exhaust hoods.
- Water Inlet ball valve.
- 1.5" side bottom drain outlet to cleaner dump drain.
- Recirculation pump with skim pipe.

STATION #8 Electro Clean 100°F

32" x 38 " x 30 "constructed from 1" thick stress relieved natural polypropylene and includes:

- Cast Bronze locating saddles for DC power and rotator.
- T304 SS heater with over-temp safety.
- Low level safety controller.
- Temperature RTD probe.
- Push / Pull exhaust hoods.
- Water Inlet ball valve.
- 1.5" side bottom drain outlet to cleaner dump drain.
- Two (2) solid copper anode bars.
- T304 stainless steel anodes.
- Bussed for 100 amps.

STATION #9-11 Triple Counterflow Rinse

88" x 38" x 30" constructed from 1" thick stress relieved natural polypropylene and includes:

- Locating saddles with hot DC rotator saddles.
- Two (2) sets of over / under flow baffles.
- Overflow weir with outlet.
- Water Inlet ball valves.
- Water solenoid controlled by PLC with adjustable "on time" from the HMI and Dwyer flow meter
- Three 1.5" side bottom drain outlets to A/A drain.

STATION #12 Acid Activator

26" x 38" x 30" constructed from 1" thick stress relieved natural polypropylene and includes:

- Locating saddles with hot DC rotator saddles.
- Push / Pull exhaust hood.
- Water Inlet ball valve.
- 1.5" side bottom drain outlet to Acid drain.

STATION #13-15 Triple Counterflow Rinse

88" x 38" x 30" constructed from 1" thick stress relieved natural polypropylene and includes:

- Locating saddles with hot DC rotator saddles.
- Two (2) sets of over / under flow baffles.
- Overflow weir with outlet.
- Water Inlet ball valves.
- Water solenoid controlled by PLC with adjustable "on time" from the HMI and Dwyer flow meter
- Three 1.5" side bottom drain outlets to A/A drain.

STATION #16-18 Triple Counterflow Rinse

88" x 38" x 30" constructed from 1" thick stress relieved natural polypropylene and includes:

- Locating saddles with hot DC rotator saddles.
- Two (2) sets of over / under flow baffles.
- Overflow weir with outlet.
- Water Inlet ball valves.
- Water solenoid controlled by PLC with adjustable "on time" from the HMI and Dwyer flow meter
- Three 1.5" side bottom drain outlets to A/A drain.

STATION #19 Cyanide Drag Out Rinse

26" x 38" x 30" constructed from 1" thick stress relieved natural polypropylene and includes:

- Containment tank.
- Locating saddles with hot DC rotator saddles.
- Water Inlet ball valve.

STATION #20-24 Cyanide Brass Plate 90°F

160" x 38" x 30" constructed from 1" thick stress relieved natural polypropylene and includes:

- Containment tank.
- Cast Bronze locating saddles for DC power and rotator.
- Titanium heater with over-temp safety.
- Titanium cooling coil with solenoid.
- Low level safety controller.
- Temperature RTD probe.
- Push / Pull exhaust hood.
- Water Inlet ball valve.
- 2500 GPH Mefiag filter assembly.
- Ten (10) solid copper removable anode bars.
- Forty (40) Titanium anode baskets.
- Plastic current shields between plating cells.
- Bused for 100 amps per station

STATION #25-28 Cyanide Brass Plate 90°F

130" x 38" x 30" constructed from 1" thick stress relieved natural polypropylene and includes:

- Containment tank.
- Cast Bronze locating saddles for DC power and rotator.
- Titanium heater with over-temp safety.
- Titanium cooling coil with solenoid.
- Low level safety controller.
- Temperature RTD probe.
- Push / Pull exhaust hood.
- Water Inlet ball valve.
- 2500 GPH Mefiag filter assembly.
- Eight (8) solid copper removable anode bars.
- Thirty two (32) Titanium anode baskets.
- Plastic current shields between plating cells.
- Bused for 100 amps per station

Off Line Cyanide Brass Plate Make Up Tank**90°F**

24" x 24" x 30" constructed from ½" thick stress relieved natural polypropylene and includes:

- Containment tank.
- Electric mixer.
- Titanium heater with over-temp safety.
- Temperature RTD probe.
- Exhaust port.
- Water Inlet ball valve.
- Cover with access door.
- Two (2) metering pumps.

Price**\$171,900.00**

IV - Tanks and Accessories Description

The tanks supplied will be manufactured by Technic Inc. Materials will be as listed in the Tank Process sheet. Tank construction will be flat, free of defects, and structurally rigid.

All polypropylene tanks are constructed using Technic's unique fusion welding hot forming equipment to eliminate vertical tank welded seams. Encased girths are added as required. Required structural steel girths are welded and encapsulated in a polypropylene shield.

Saddles will be fastened with T304 stainless steel hardware.

Saddles are polyglass or polypropylene on non-electrified tanks and cast bronze on electrified stations.

Rinse tanks will be supplied with 3" wide by full width final overflow. Multistation counterflow tanks will have full depth over and under flow design.

Tank drain sizes as per Tank Specification sheet.

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Heating coil or element material as per Tank Specification sheets and sized for 2-4 hour heat up from 65°F (ambient temperature) using 480/3/60 electric. All plumbing and wiring on the front side of the system.

Process tanks come with in-tank visual fill scale for operating level and low level.

Note: External tank plumbing or AC electrical wiring on any of the above is provided in - Factory Assembly Tank Modules.

V - Factory Assembly (Modularization)

A. Tank Modules

Tanks to be mounted on base frame made of structural steel primed and painted with acid resistant epoxy paint. Flexible PVC sheet will be installed between the tanks and epoxy coated steel base frame. PVC will overhang base beam 3" on either side to ensure that drips do not collect on beams and form corrosion cells. The tanks will be bolted to the tank base using type 304 stainless steel hardware to hold the tanks firmly in place. All exterior tank piping connected to headers running to one end of the line including drains, water feeds and push air. All piping will be labeled accordingly with (Seton type) pipe labels.

All electrical wiring for temperature probes is completed to a junction box on the tank line. Conduits and NEMA 4 junction boxes are NEC approved plastics.

Drip shields are supplied over rim barriers on adjacent tanks. Shields are formed for fit and construction of Type II high impact PVC or (16) gauge stainless steel as required for process.

All piping and electrical piping headers to be supported by stainless steel uni-strut stand-offs and clamps. Tank base frame with piping to be arranged with couplings and tank bases are split to allow breakdown for shipment, and reconnection in convenient lengths of 10-20 feet, or as required.

B. Scope of Factory Assembly

Scope of Factory assembly includes the following:

Bottom drains and valves. Schedule 80 CPVC.

Drain headers: (1) A/A Rinse, (1) Acid Dump, (1) Cleaner Dump and (1) Cyanide Rinse. The field connection point will be determined and the header will be located on the front side of the line.

City water fills and header schedule 80 PVC. The field connection point will be determined and the header will be located on the front side of the line.

Hose bibs will be provided and installed every 15 feet along the tank line. Includes manuals, testing and disassembly for shipment.

Price

\$131,600.00

VI - Exhaust Equipment

ACID

PVC VENTILATION SYSTEM FOR (5) TANKS @ 5348 CFM. CFM VOLUME BASED ON PUSH-PULL @ 125 CFM/FT². SYSTEM DESIGNED TO REMOVE APPROXIMATELY 99% OF PARTICULATE TO 6 MICRONS.

MAPCO TYPE MU3 EXHAUST HOODS to exhaust (5) tanks. Hoods to be 36", 30" 32" and 26" wide, all 24" high with (2) slots. Features include drain, drip lip, flexible outlet connection with S.S. draw band and side push shields to span the distances between hoods.

MATERIAL - type II, grade I, high impact gray 3/16" and/or 1/4" thick corrosion-resistant PVC.

PVC DUCTWORK - Mapco custom made PVC ductwork to ventilate (5) tanks.

MATERIALS - Ductwork to be fabricated from type II, grade I, high impact, and type I, grade I, normal impact, gray 3/16", 1/4" and 3/8" corrosion-resistant PVC. Accessories include butterfly locking dampers and couplings at ductwork connections.

DUCT PRICES BASED ON THE FOLLOWING:

1. Approximate centerline of trunkline 12'-0".
2. Approximately 20' roof height.
3. Fan and scrubber located on the roof approximately 10' from the roof opening.
4. Average tank height of 42" above finished floor.

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NOTE: Couplings are fabricated and are not close tolerance like molded fittings. Mapco will not be responsible for leaks should gluing be the preferred method of joining duct.

MAPCO FUME SCRUBBER MW-100-6-3-R horizontal cross flow @ 5348 CFM, 2.5" SP.

INTERNALS - 3 feet of Pro-Pak 3.5 corrosion resistant polypropylene packing, Mapco chevron mist eliminator, 4" of removable MW-5, high efficiency polypropylene mesh pad mist eliminator, 3/8" thick removable flanged spray headers, Delevan, hollow cone spray nozzles.

MATERIALS - type II and type I, grade I high and normal impact white 3/8" thick PVC construction, clear PVC inspection ports, 3/8" thick bolt on pack clean out and fill doors, 3/4" thick inlet and outlet flanges, enamel coated steel channel base with lifting lugs, stainless steel hardware and 100% silicone caulking.

ACCESSORIES – blow down rotameter, circulation rotameter, magnehelic gauge and common base to share with the fan.

TRANSITIONS - inlet and outlet transitions constructed of 3/16" and or 1/4" type II, grade I, white corrosion-resistant PVC with 2" X 3/4" thick mating flange and external reinforcing, silicone caulking, stainless steel bolts, lock washers, flat washers and nuts.

REMOTE RECIRCULATION SYSTEM - to recirculate 42 GPM with automatic freshwater make-up, constant .1 GPM blow down, 31"Ø X 48" high polyethylene tank, removable cover, overflow, drain, 2 HP 230/460/3/60 CPVC vertical pump, gate valve, ball check on pump suction, ball check on pump discharge, strainer, LC3 level controller, mechanical float and PVC normally closed solenoid valve.

pH CONTROL SYSTEM - to include pre-amp, holder, electrode, chemical feed pump and 110/1/60 pH controller mounted inside a NEMA 4x enclosure.

NOTE:

1. Chemical feed pump is supplied loose. Technic will supply mounting shelf.
2. Controller is mounted to the scrubber.

REAGENT HOLDING TANK - carboy of caustic soda to be provided by *Customer*.

MAPCO MODEL GP - centrifugal fan no. 22 set up to exhaust 5,348 CFM, @ 6.0" total SP, SWSI, 1876 FPM outlet velocity, 1858 RPM, 8.75 BHP, 10 HP, 1750 RPM, TEFC, 230/460/3/60 motor, adjustable motor base, class II, corrosion-resistant coated steel wheel, arrangement 10, CW rotation, UB discharge, weather cover, constant speed V-belt drive, heavy duty pillow block bearings, enamel coated steel base, lifting lugs, 3/8" thick bolt-on inspection door, shaft seal, drain, flexible inlet connection and stainless steel hardware.

MATERIALS - fan shall be constructed from type II, grade I, high impact white, 3/16", 1/4", 3/8" and 3/4" corrosion-resistant PVC with 2" X 3/4" thick outlet flange. Fan shall be balanced electronically with a vibration analyzer to insure smooth operation.

VIBRATION ISOLATORS - housed spring type vibration isolators with non-skid neoprene acoustical pad for static deflection in excess of 1/2".

STACK AND TRANSITION – 20"Ø exhaust stack 6'-0" high with fan outlet transition, rain skirt and stack cap with back draft damper.

MATERIALS - type II, grade I, high impact white, 3/16" and or 1/4" corrosion-resistant PVC with 2" X 3/4" thick mating flange.

CYANIDE

PVC VENTILATION SYSTEM FOR (2) TANKS. BRASS AND COPPER MAKE-UP @ 9,687 CFM. CFM VOLUME BASED ON PUSH-PULL @ 125 CFM/FT².

SYSTEM DESIGNED TO REMOVE APPROXIMATELY 99% OF PARTICULATE TO 6 MICRONS.

MAPCO TYPE MU3 EXHAUST HOODS to exhaust (2) tanks. Hoods to be 63" and 77" wide X 24" high with (2) slots. Features include drain, drip lip, flexible outlet connection with S.S. draw band and side push shields to span the distances between hoods.

MATERIAL - type II, grade I, high impact gray 3/16" and/or 1/4" thick corrosion-resistant PVC.

PVC DUCTWORK - Mapco custom made PVC ductwork to ventilate (2) tanks and (1) brass make-up.

MATERIALS - Ductwork to be fabricated from type II, grade I, high impact, and type I, grade I, normal impact, gray 3/16", 1/4" and 3/8" corrosion-resistant PVC. Accessories include butterfly locking dampers and couplings at ductwork connections.

DUCT PRICES BASED ON THE FOLLOWING:

1. Approximate centerline of trunkline 12'-0".
2. Approximately 20' roof height.
3. Fan and scrubber located on the roof approximately 10' from the roof opening.
4. Average tank height of 42" above finished floor.

NOTE: Couplings are fabricated and are not close tolerance like molded fittings. Mapco will not be responsible for leaks should gluing be the preferred method of joining duct.

MAPCO FUME SCRUBBER MW-100-10-2-R horizontal cross flow @ 9,687 CFM, 2.5" SP.

INTERNALS - 2 feet of Pro-Pak 3.5 corrosion resistant polypropylene packing, Mapco chevron mist eliminator, 4" of removable MW-5, high efficiency polypropylene mesh pad mist eliminator, 3/8" thick removable flanged spray headers, Delevan, hollow cone spray nozzles.

MATERIALS - type II and type I, grade I high and normal impact white 3/8" thick PVC construction, clear PVC inspection ports, 3/8" thick bolt on pack clean out and fill doors, 3/4" thick inlet and outlet flanges, enamel coated steel channel base with lifting lugs, stainless steel hardware and 100% silicone caulking.

ACCESSORIES – blow down rotameter, circulation rotameter, magnehelic gauge and common base to share with the fan.

TRANSITIONS - inlet and outlet transitions constructed of 3/16" and or 1/4" type II, grade I, white corrosion-resistant PVC with 2" X 3/4" thick mating flange and external reinforcing, silicone caulking, stainless steel bolts, lock washers, flat washers and nuts.

REMOTE RECIRCULATION SYSTEM - to recirculate 47 GPM with automatic freshwater make-up, constant .25 GPM blow down, 31"Ø X 48" high polyethylene tank, removable cover, overflow, drain, 3 HP 230/460/3/60 CPVC vertical pump, gate valve, ball check on pump suction, ball check on pump discharge, strainer, LC3 level controller, mechanical float and PVC normally closed solenoid valve.

pH CONTROL SYSTEM - to include pre-amp, holder, electrode, chemical feed pump and 110/1/60 pH controller mounted inside a NEMA 4x enclosure.

NOTE:

1. Chemical feed pump is supplied loose. Technic will supply mounting shelf.
2. Controller is mounted to the scrubber.

REAGENT HOLDING TANK - carboy of caustic soda to be provided by *Customer*.

MAPCO MODEL GP - centrifugal fan no. 30 set up to exhaust 12,876 CFM, @ 6.0" total SP, SWSI, 2491 FPM outlet velocity, 1410 RPM, 18.4 BHP, 20 HP, 1750 RPM, TEFC, 230/460/3/60 motor, adjustable motor base, class II, corrosion-resistant coated steel wheel, arrangement 10, CW rotation, UB discharge, weather cover, constant speed V-belt drive, heavy duty pillow block bearings, enamel coated steel base, lifting lugs, 3/8" thick bolt-on inspection door, shaft seal, drain, flexible inlet connection and stainless steel hardware.

MATERIALS - fan shall be constructed from type II, grade I, high impact white, 3/16", 1/4", 3/8" and 3/4" corrosion-resistant PVC with 2" X 3/4" thick outlet flange. Fan shall be balanced electronically with a vibration analyzer to insure smooth operation.

VIBRATION ISOLATORS - housed spring type vibration isolators with non-skid neoprene acoustical pad for static deflection in excess of 1/2".

STACK AND TRANSITION – 28"Ø exhaust stack 6'-0" high with fan outlet transition, rain skirt and stack cap with back draft damper.

MATERIALS - type II, grade I, high impact white, 3/16" and or 1/4" corrosion-resistant PVC with 2" X 3/4" thick mating flange.

ITEMS FOR BOTH SYSTEMS

HIGH PRESSURE BLOWER - model no. HPB-14N6, 478 CFM, 15.5" SP, SWSI, 2390 FPM outlet velocity, 1.97 BHP, arrangement #4 direct drive, CW rotation, BH discharge, flanged outlet and inlet, aluminum wheel, 3 HP, TEFC, 3500 RPM, 230/460/3/60 motor.

MATERIALS - fan shall be constructed from 10 gauge steel with 1/4" steel plate pedestal coated with medium gray enamel. Wheel shall be balanced electronically with a vibration analyzer to insure smooth operation.

PUSH DUCT AND HEADERS – duct and headers shall be schedule 40 and 80 type I, grade I normal impact, corrosion-resistant PVC pipe. Each push header shall include a gate valve or blast gate damper.

MASTER CONTROL PANEL - built to NEC specifications. Standard features include master on/off switch, on/off switch for each motor, pilot indicator lights for each motor, over load protection, terminal point connections, fused 1 kVA control transformer and NEMA 4 control panel wired for 460/3/60 with (1) 3 HP pump motor starter, (1) 5 HP pump motor starter, (1) 3 HP push fan motor starter, (1) 15HP exhaust fan motor starter, (1) 20 HP exhaust fan motor starter and 110V power connections for (2) LC3 level controllers and (2) pH systems.

INSTALLATION of the proposed equipment and ductwork to be performed by Mapco factory trained non-union personnel or MAPCO approved sub-contractor. Installation will include setting (2) scrubbers, (2) exhaust fans, (1) push fan, (11) hoods, (2) rain skirts, (2) stacks, (9) push hoods and erection of all duct.

HANGERS - 1-1/2" X 3/16" thick stainless steel flat bar rolled to fit duct dia. Each hanger shall be of two piece construction and supported with two (2) pieces of 3/8" dia. stainless steel all-thread rods clamped to roof structure with mild steel beam clamps.

HOOD SUPPORTS - Exhaust hoods shall be bolted to tank lip and independently supported from the floor, wall or tank.

PUSH HEADERS - Push headers shall be mounted with PVC or stainless steel clamps mounted to a 90° bracket fabricated from 1-1/2" X 3/16" stainless steel.

ROOF MOUNTED EQUIPMENT - Equipment (scrubbers and fans) shall be set on 4" X 6" treated wood supports set in tar or platform supplied by customer.

GROUND LEVEL EQUIPMENT - Equipment (scrubbers and fans) shall be set on concrete pad or platform supplied by other. If this is not acceptable, other options can be quoted by Mapco or supplied by other. Remote scrubbers must be elevated to allow scrubber liquor to drain back to tank or building.

BY Client/MFT - Crane cost and/or fork truck to set or move equipment, boom lift to install hangers, and duct (required for roof heights over 18'-0"), plumbing and electrical (materials and labor), roof openings, roof curbs, painting, permits, testing, tear out, steel platforms, staging area for equipment and ductwork (within close proximity of installation site) and 110 volt outlet within 50'-0" of installation.

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NOTES:

- 1) **ROOF STRUCTURE** - Responsibility for adequate roof structure to support equipment on roof or ductwork from ceiling shall be by **Client**
- 2) **ROOF OPENINGS** by **Client**
- 3) **SETTING EQUIPMENT** - Crane cost associated with setting equipment and or ductwork shall be by **Technic**.

Price	\$194,400.00
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VII – Barrels

Fifteen (15) B&P barrels. 12" x 24" complete with DC motor assembly set downs and automatic pickups completely wired and ready for production.

Price	\$59,500.00
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Note: Credit will be issued if Client supplied "New Design" cylinders are provided for

VIII – Rectifiers American Plating Power

- 1 **Multi-Output Cabinet**
3ph, 480Vac, Air-Cooled, w/ 4-20mA Interface

Ten (10) 12 Volt DC/100 Amp.

Description:

Our **Multi-Circuit Cabinet** is equipped with our advanced switch mode **MS-Series Family** DC rectifiers. The system consists of air-cooled rectifiers in a Nema 12 cabinet.



This compact DC rectification system is based on modular technology built into sturdy steel cabinet with front door access and removable side panels. Our system offers a unique blend of accessibility, flexibility, safety and reliability.

Construction:

The **Multi-Circuit Cabinet** has been specially designed to overcome the accessibility problems of many systems. Simply by opening the steel front door, the operator has access to all the rectifiers, support components and cabling. Accessories are mounted on a separate plate to one side of the cabinet. The AC input will be through a Main Disconnect and DC output is realized from the front of the rectifiers. Combined with the fact that the individual units are fixed to the cabinets frame and the cables are led through cable tray to one side of the cabinet, makes the rectifiers easier to install, remove and/or replaced quickly.

Although working as part of an integrated system, each rectifier operates independently. Each rectifier is protected by individual circuit breakers, which means each rectifier can be safely isolated while the others in the system continue operating.

In addition to the thorough attention to design and construction quality, the carefully laid-out cooling system allows the air-cooled power modules inside the cabinets to work extremely reliable with a long lifespan.

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A special designed **Air Guiding System** in the power modules keep the electronic components out of the air flow, which prevents premature failure of the rectifier.

Each power module receives fresh cool air through the front of the power and exhausted directly through the back of the cabinet, rather than passed onto the next power module in the system. In combination to the **Air Guiding System**, an **Automatic Fan Speed Control** adjusts the air flow to the required cooling and reducing wear of the rectifier cooling fans. With this layout, the cabinet is closed with cooling air entering through air vents located on the cabinet.

MS-Series Family Rectifiers:

The rectifiers themselves are, of course, at the very heart of the system. This multi-circuit cabinet will use our **MS-Series Family plug-in modules**. It has been especially developed for use in multi-circuit power supplies and is light enough to simply be slid in and out of its place, as required.

The advanced switch mode technology of the **MS-Series Rectifier** allows for a compact construction and provides a **constant low ripple of < 1% over the full output range**. The modular plug-in construction allows unparalleled flexibility and user friendliness. Along with the standard protection offered by the cabinet, each rectifier is built into its own powder coated metal enclosure for additional protection.

The rectifier's power circuit is designed for **continuous operation at the rated output** and is especially designed for industrial applications.

Main Components:

- Main power in
- Power distribution within the cabinet
- Separate circuit breakers for each rectifier
- Separate rectifier modules in a compact plug-in technology
- EMC filter
- Power semiconductors for pulse amplitude modulation
- Electronics for constant current and voltage control
- Shunt

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Protection Devices:

- Main disconnect for the whole cabinet
- Separate circuit breakers for each rectifier
- Temperature monitoring for each rectifier
- Over current protection
- Short-circuit protection
- Over temperature supervision for each module

System Interface per Rectifier:

- Set-point adjustment for V + A: **4-20mA**
- Actual feedback values value 0 - Ug, 0 - Ig: **4-20mA**
- On/Off through potential-free contact (Customer)
- Fault through potential-free contact (Customer)

Special Feature (X):

- 4-20mA Interface (**APP1007**)
- 30kVA Step-Down Transformer (480:230Vac)
-

Technical Data:

Mains voltage:	3 x 480 V / 50-60 Hz + PE
Input current:	19 A @ 480Vac
Mains power:	15.8 kVA @ 480Vac
Power factor:	> 0.94
DC output voltage:	10 x 12 Volt
DC output current:	10 x 100 Amp
Duty factor:	100 %
Ripple:	< 1 % across full range of control
Adjustment:	1 - 100 %
Control:	constant current and voltage
control	
Control accuracy:	< 1 %
Cooling:	air-cooled
Ambient temperature:	up to 95 °F
Site altitude:	up to 3280 ft. above sea level
Cabinet Dimensions:	39/ 32/ 79 (W/ D/ H) inches (+4" inches base)
Protection grade:	Nema 12

Price**\$35,625.00**

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IX - Field Installation / Startup Services

Price based on the customer completing the following:

Technic will provide installation drawing allowing the customer to have local contractors bid the plumbing and electrical installation.

Electrical includes:

- ▶ Power from facility disconnects to control panels.

Conduit and wiring from the control enclosures to include:

- ▶ Tank line junction box.
- ▶ Rectifier area.
- ▶ Hoist junction box to main enclosure.

Plumbing:

- ▶ Facility connections from line for city water and drains.

Technic, Inc. will complete the following:

- Unload equipment.
- Rig to location.
- Assemble hoist frame.
- Assemble tank line sections.
- Reconnect plumbing and electrical at shipping splices.
- Reconnect exhaust hoods.
- Install exhaust ductwork to ceiling stubs directly above the centerline of the system.
- Install hoists.

Price includes:

- Lift truck rental.
- System start up and training.

Price

\$60,000.00

X - Miscellaneous

Dryer:

Three (3) DESCO 12 x 12 electric heat dryers with the following

1. Electric Heat 6 Kw.
2. Automatic Reversing with a 1-30 minute cycle timer for both forward and reverse directions. Timers are set by customer. Timers located inside the panel.
3. Horn and strobe light.
4. Total (6) HD Polypropylene baskets. 3/8" sidewalls with 3/32" or larger perforations, 1" thick machined bottom and solid stainless steel handle.

Price Three Units	\$42,900.00
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Brass Chiller:

One (1) Ritetemp Chiller 1 ton. Includes plumbing installation.

Price	\$10,800.00
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Water Filter:

One (1) Stainless steel duplex water filter assembly, 15 gpm 1 micron. Includes Installation.

Price	\$5,200.00
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XI - Items Not Included in this Proposal

1. Necessary removal or relocation of existing equipment or utilities. Lighting or relocation of existing lighting.
2. Facility or modifications to building or roof.
3. Concrete work, piers, sumps or floor coatings.
4. Room make-up air for exhaust systems.
5. AC power distribution panel, bus-duct branches, and step down transformers.
6. Chemicals or anodes.
7. Racks, special fixtures, or tools.
8. Freight to customer facility.
9. Environmental or construction permits.
10. Fees, licenses, taxes of any kind.
11. OSHA energy lockout devices.
12. Back flow preventers for main header lines.
13. Catwalk.
14. Field electrical contactors or disconnect switches.
15. Waste water chemical treatment units.
16. Items not specifically offered in this proposal.

XII - Price Summary

AUTOMATION	\$212,000.00
TANKS AND ACCESSORIES	\$171,900.00
FACTORY ASSEMBLY.....	\$131,600.00
EXHAUST EQUIPMENT	\$194,400.00
BARRELS.....	\$59,500.00
RECTIFIERS	\$35,625.00
FIELD INSTALLATION / START UP SERVICES.....	\$60,000.00
MISCELLANEOUS EQUIPMENT:	
Three (3) Dryers w six (6) baskets.....	\$42,900.00
Mini Chiller Installed	\$10,800.00
Water Filtration installed.....	\$5,200.00

TOTAL SYSTEM PRICE.....\$923,925.00

Note: No optional costs are included in Total System Price.

XIII - Project Schedule

Shipment of Equipment: 20 - 22 weeks after drawing approval.

FOB Shipping - Shipping Points and Pawtucket, Rhode Island

TERMS: 10% % down payment due with purchase order.

40% % due upon approval of engineering drawings.

40% % due upon inspection prior to shipment.

Account Notice:

Original purchase order was based on quote Q150226-R6 which totaled \$1,140,800.00

10% deposit of this total amount equaled \$114,080.00 and was paid with purchase order.

Revised quote Q150226-Rb totals \$923,925.00 of which 10% deposit would be \$92,392.50 Thus the deposit payment was overpaid by \$21,687.50 which will be credited to the next payment of 40% with drawing approval.

10% plus \$21,687.50 was paid for deposit totaling **\$114,080.00**

40% with engineering drawing approval will be \$369,570.00 less the overpayment of \$21,687.50 thus **\$347,882.50**

40% with inspection prior to shipment equals **\$369,570.00**

10% final payment will be **\$92,392.50**

Total payments equal \$923,925.00

Progressive payments to 90% of total contract due before shipment.

10 % due 45 days after delivery or start up of equipment, whichever comes first.

Note: Factory major equipment assemblies are normally scheduled on commercial carrier exclusive air-ride vans to ensure safe, prompt shipment. Customer to specify other arrangements if required.

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XIV - Terms and Conditions

A. OSHA

Seller is using its best efforts to comply with those OSHA rules and regulations that are in effect at the time of this quotation. If, any time prior to start-up of the equipment, it is found that the equipment does not comply with the OSHA rules and regulations, whether because of issuance of new rules and regulations or modification of existing rules and regulations, seller will, at the customer's request, negotiate the costs for updating the equipment to comply with such rules and regulations. Furthermore, since these regulations are subject to interpretation of the local OSHA inspection, some minor additions may be required at the time of installation. The costs incurred because of any additions will also be negotiated.

B. WARRANTY

Seller agrees, at its discretion, to repair, replace or provide a refund for any item of equipment proved to be defective in material or workmanship, under normal use and operational conditions, for a period of 12 months from the date of delivery. If the equipment operates more than eight hours per day, each eight hour shift shall be equivalent to one day, and non-use shall in no way increase the 12 month limit. Seller may require Buyer to return any defective parts or material to Seller's plant at the expense of Buyer for inspection. The above remedies shall be exclusive of any other remedies the Buyer might have, and no claim of any kind shall be greater in amount than the purchase price of the item of equipment found to be defective. Any item not manufactured by Seller is subject to the Warranty issued or considered standard practice by the manufacturer thereof, and the item is warranted by Seller only in accordance therewith. Seller shall have no liability for any loss of, or delay in production, or for any incidental or consequential damages. Seller assumes no responsibility for any delay in fabrication, assembly, delivery or installation of the equipment caused by strikes, acts of God, civil commotion, war, Government regulation, unavailability of materials or services, any act of omission of Buyer or other condition beyond control of Seller, and Seller shall have no liability for damages or loss caused thereby.

C. Field Service

The Seller will provide field service on request at any time during the life of the equipment. The Buyer is responsible for the cost of labor and travel expenses for the visit for both warranty and non-warranty items.

D. Price

The price quoted is firm for 30 days from this date, except as otherwise stated and thereafter will be subject to change anytime prior to acceptance of Buyer's purchase order by Seller.

E. Cancellation

An order may be canceled only with the written consent of the Seller, and upon terms that will protect the Seller against loss on all costs incurred and will further provide a fair profit on the work performed on such order.

F. Changes

A change in the specifications, related to the equipment or in shipping instructions or specified delivery date, may be made only with the approval of the Seller. If a change made at the request of the Buyer increases the Seller's cost, such increase may be added to the purchaser's price at the election of Seller.

G. General

The undertakings of the Seller herein are limited to the Buyer and are not assignable by Buyer and, shall terminate upon sale or other transfer of the equipment by Buyer. If any provision of Buyer's purchase order is inconsistent with a provision of this proposal, the provision of this proposal shall control. Seller is willing to sign a non-disclosure agreement.

H. Taxes and Permits

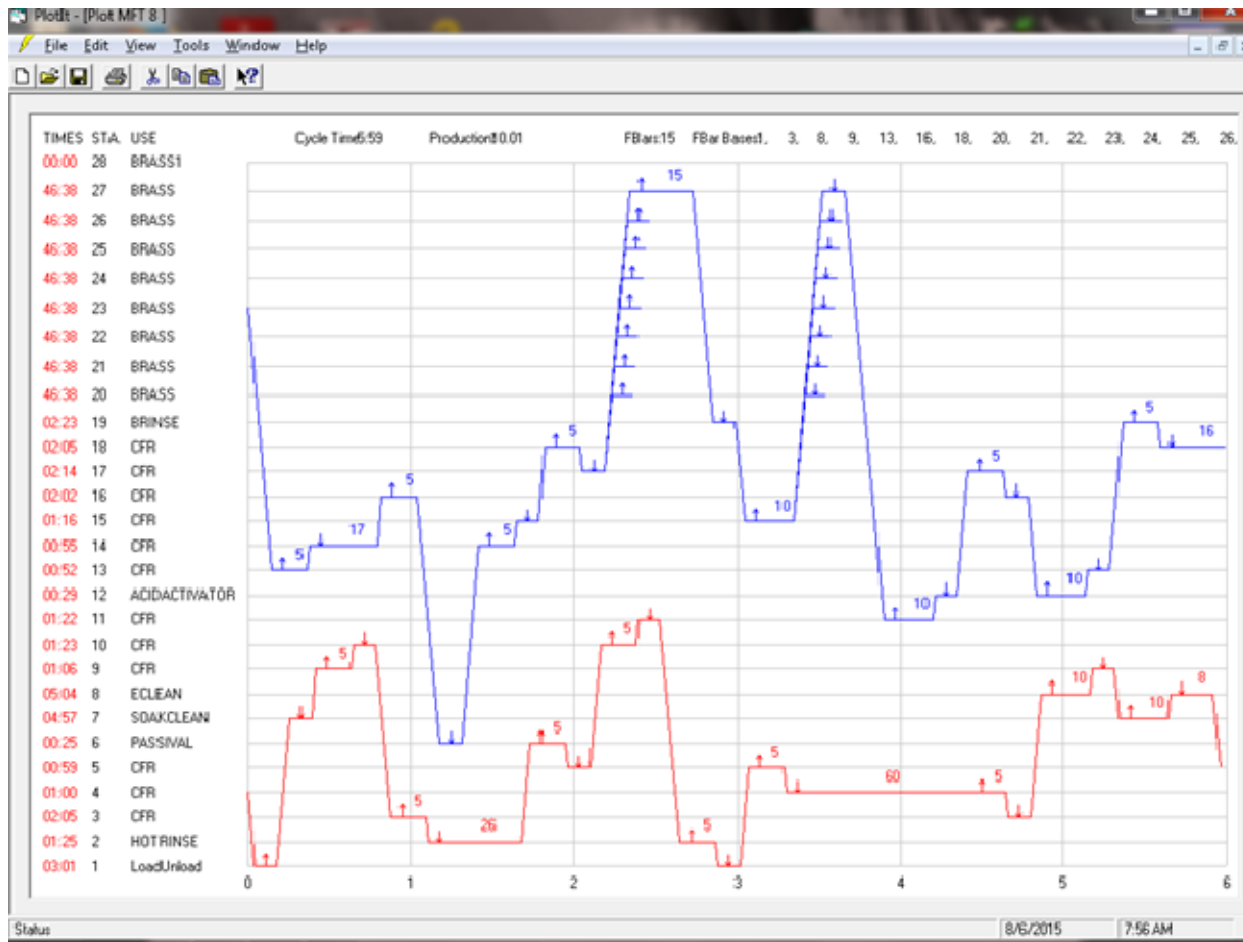
Taxes, license fees, environmental or construction permits are the responsibility of the buyer.

I. Freight

Freight is quoted FOB Origin unless explicitly stated otherwise. If a price for freight is listed in the quote, it is for budgetary purposes only. The actual freight cost will be passed on to Buyer.

[illegible]

Station		Heat	Cooling	Temp.	Level	Rectifier	Anode	Anodes or	Push/Pull	Filter	Recirc.	PH	Tank	Chemical	Mixer	Comments
No.	Process	Coil	Coil	Control	Safety	Qty/Amps/Volts	Bars	Baskets	Exhaust	GPH	Pump	Moinitor	Covers	Feed		
1	Load/Unload															
2	Hot DI Rinse	316 SS		RTD					Yes							
3-5	Triple Counterflow Rinse															Future heat in sta.3
6	Passival	PTFE	PTFE	RTD	Yes				Yes			Yes		Yes		
7	Soak Clean	304 SS		RTD	Yes				Yes							
8	Electro Clean	304 SS		RTD		1/100/12	Copper	304 SS	Yes							
9-11	Triple Counterflow Rinse															
12	Acid Activator								Yes							
13-15	Triple Counterflow Rinse															
16-18	Triple Counterflow Rinse															
19	CN Drag Out Rinse															
20-24	CN Brass Plate	Titanium	Titanium	RTD	Yes	5/100/12	Copper	Titanium	Yes	2500	Yes	Yes	Yes	Yes		
25-28	CN Brass Plate	Titanium	Titanium	RTD	Yes	4/100/12	Copper	Titanium	Yes	2500	Yes	Yes	Yes	Yes		
	Off Line															
	Brass Makeup	Titanium		RTD					cover port				Yes	Yes	Yes	
	Spin Dryers (3)															



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