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Presentation Title

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Learn. Innovate. Collaborate.

Implementing process control of your High Phosphorous EN line to ensure a quality deposit, increase your market share and save your company money.

- Equipment specs that can solve common deposit problems in the industry while improving your bath life and plating rate.
- Pretreatment for high phosphorus EN.
- Bath parameters to achieve a homogenous and amorphous coating (10-13%).
- Quality control to ensure you have a true amorphous high phosphorus coating.
- If everything is right what advantages you will give your customers.
- Conclusion and how this can help increase market share and save you money!!
- Actual pictures of growth from a job shop who implemented these practices.

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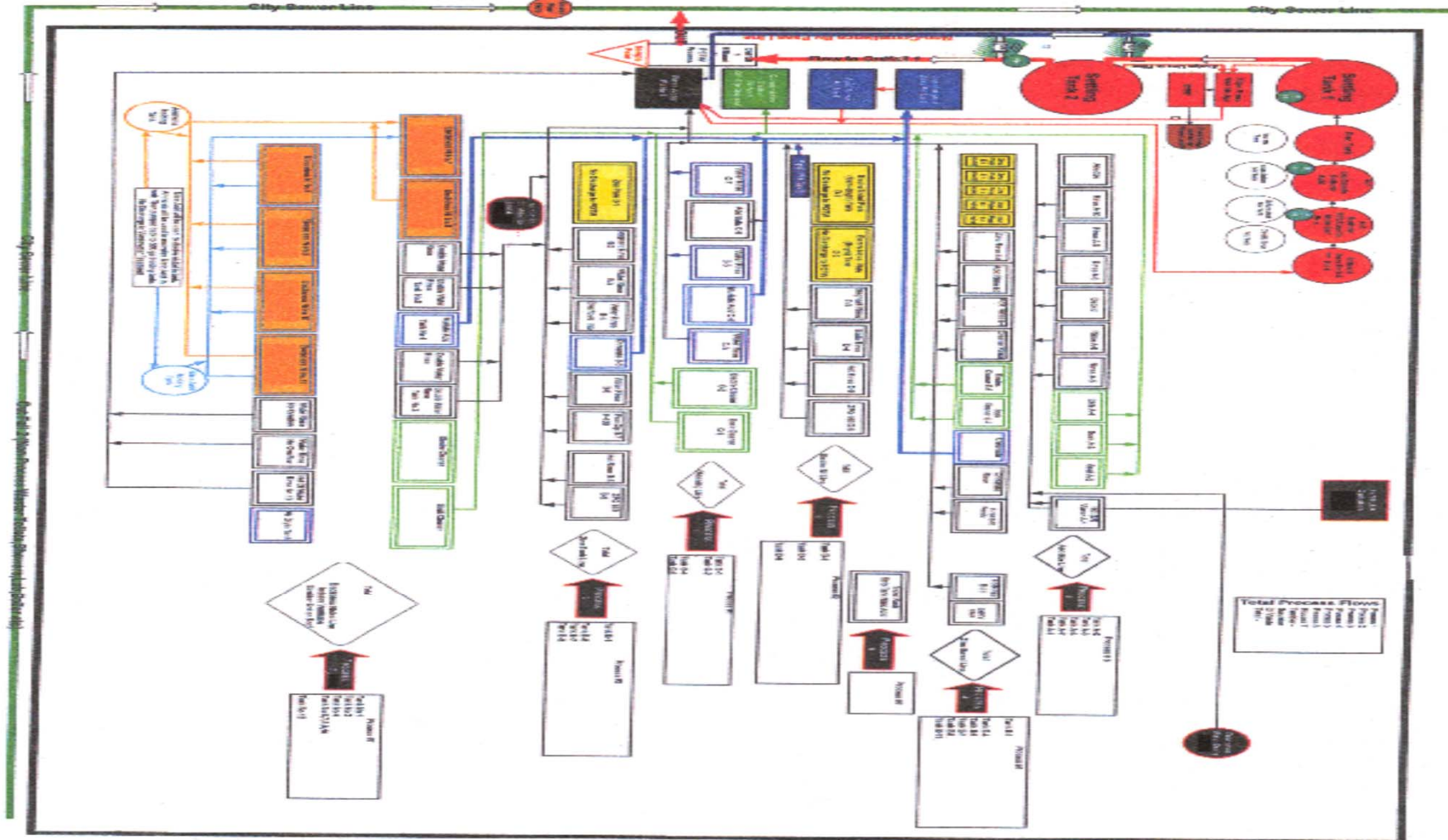
Its Starts with equipment

- Dedicated line for your EN jobs wit an actual print of a high production EN line that has a less than 1% reject rate.
- Types of Equipment needed with a print of the EN tank.
- Proper filtration, plumbing and tank design will ensure a true amorphous homogenous deposit. This will also increase bath life and save you money.
- What this does for your EN bath and bottom line.

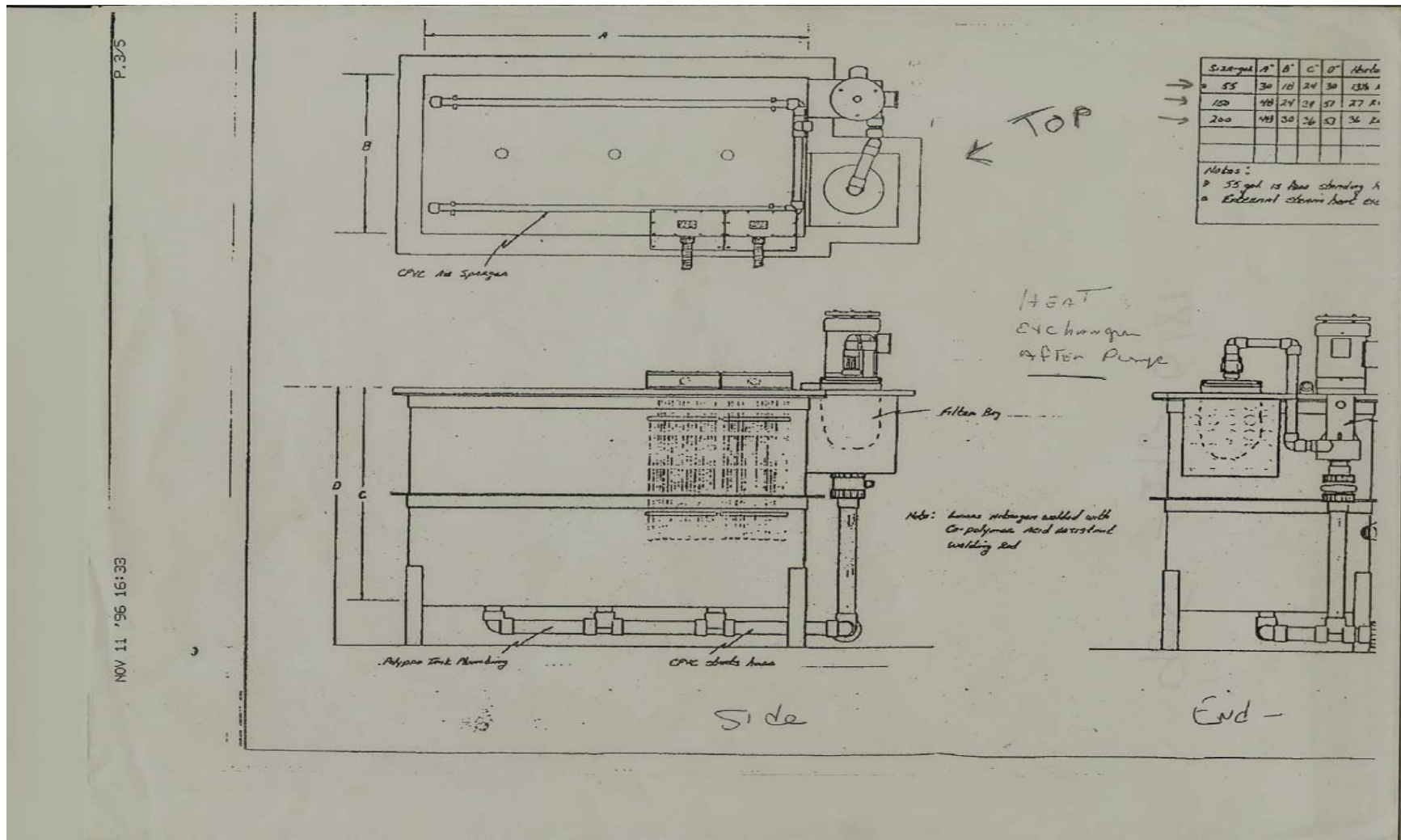
Dedicated Line for EN



Print of plating shop that shows a horse shoe EN system (that is separate from all other plating) that plates up to 20,000 parts a day



Print of a actual EN tank that can improve your bath life and deposit.



Plumbing and filtration



The bottom line of having proper equipment.

- Increase bath life and faster plating rate. That is what all platers want!!
- Less rejects
- Cuts down on pitting, roughness, staining and most common EN problems.
- Cuts way down on contamination from Nitric Acid and any drag in.
- Can give you the ability to transfer your tanks in minutes and not hours. Thus reducing plate out and wasted Nickel.

Pre-Treatment

- This all goes hand in hand with the dedicated line for EN
- Basic set up is SC,EC,DBLR,HCL30-50%, DBLR, At least two EN tanks for transfer system with a gravity fed system.
- Drag in is a killer for high phos!!
- It takes one shake of a salt shaker to destroy a high phos deposit

Bath Parameters to achieve 10-13% phosphorous deposit

- Nickel and Hypo % (85%-100%)(28-34 g/l)
- Loading (.5 a square foot/gallon)
- Temp and PH (180-192 F 4.4-5.0)
- Plating Rate (.0002-.0005)
- Amount of air
- Filtration (5 micron bag)
- Pumps(3-4 turns and hour)
- How often should you test bath (titrations of hypo, nickel and ortho)
- Automatic Feeders (Calibrate! Calibrate ! Calibrate)

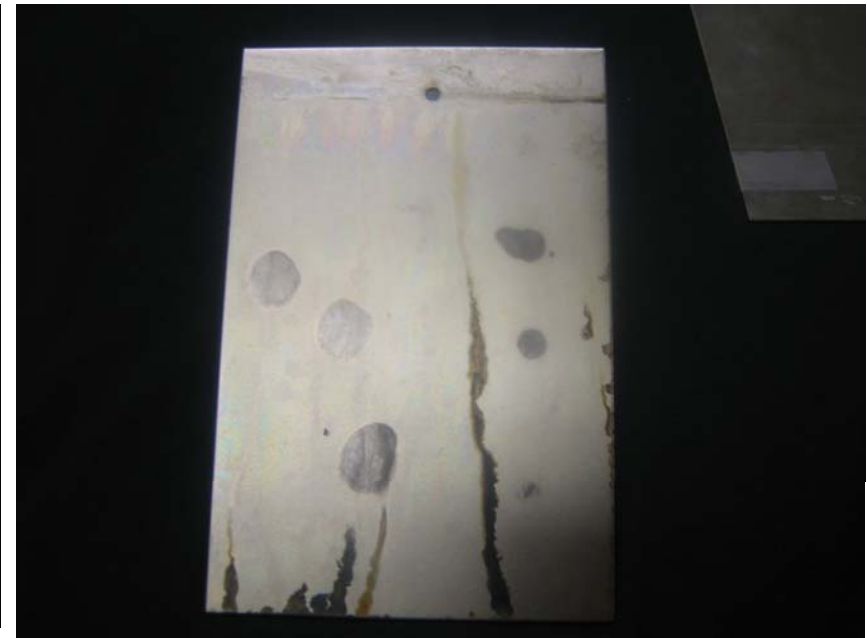
The most common ways to QC your High Phosphorous Deposit

- **Test:** RCA Nitric test. This is a simple and effective way to tell if you have a true High Phosphorus bath. This test will show if you have defects in the deposit. This test should be done when the bath is new, and periodically through out the life of the bath. This test is cheap and easy.

Procedure for Nitric Test

- **Materials Needed:** A carbon steel coupon 4x1 inches. Nitric acid 60-70% that is pure and has no evidence of water. A pipette and a stop watch or a third hand on any clock.
- **Procedure:** The coupon is plated in your “high phosphorous” bath to a thickness of .00025-.0005. The less thickness is better showing a excellent corrosion resistance. The part is dried off completely. Nitric acid is taken by pipette then dropped on the plated part. Stopwatch is started soon as the Nitric hits the part.
- **Results:** 30 seconds should go by before any black appears. 1-2minutes is excellent. If black appears before 30 seconds then it is a failure. This means you do not have a 10-12% phosphorous bath and will have corrosion problems.

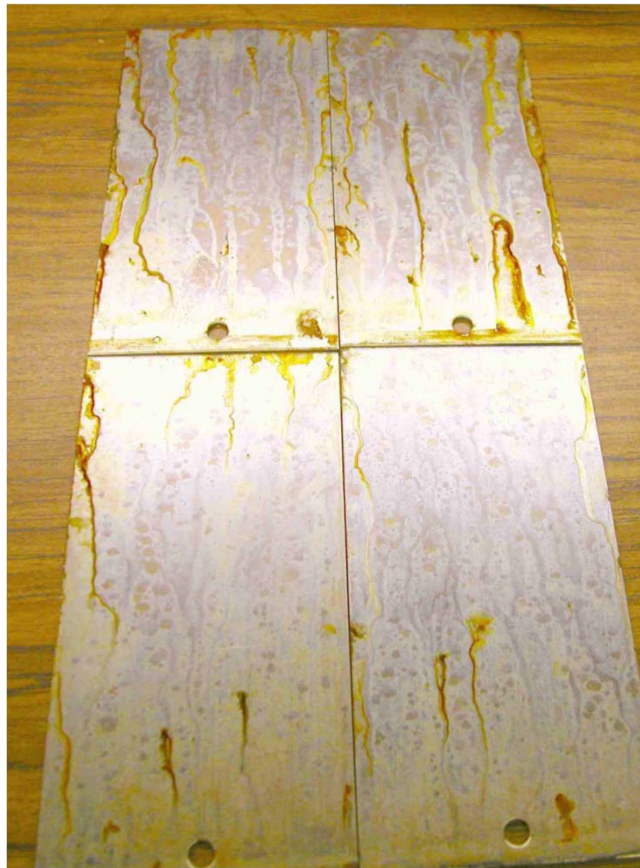
Picture of a Nitric test/Salt Spray. Both panels went through Salt pray (100 hours @ .0005) and then Nitric testing. This was for a very high corrosion application.



Procedure for Salt Spray

- **Test:** ASTM B 117 Salt spray. This test should be done by a independent lab. This test will show you if you can meet corrosion standards that are in many prints.
- **Materials Needed:** 6x4 inch panel of cold rolled steel.
- **Procedure:** A carbon steel coupon is to be plated .0004-.003. The lower the thickness the better the corrosion factor and the less expense it is to the plater. .0004 has been documented. This is sent to a Lab for the test. This test should be done every month or at least once a year. Also should be done at all stages of the baths life.
- **Results:** Less than 1% (*in some tests this is acceptable) of the panel can have rust. Anymore than that is a failure. This test is commonly failed because of the lack of true High Phosphorous baths.
- * panels below passed with less then 1% red rust and the edges where not counted.

ASTM B 117 SS test passing 100 hours @ .0004



Adhesion Pass @ .0015 (in compression)



Adhesion Failure (in tension)



Other tests

- HCL 24 hour test (immersion test)
- Pin hole test (checks for pits and shows Iron)
- Phosphorus test (Stainless steel plated then dissolved in Nitric)
- NADCAP testing (most of these tests will be required for you to pass)
- Hardness testing (.004 mils needed for RC test)

Deposit Properties

- Phosphorous Content 10-13%
- Hardness 48-52 Rc as plated
- 68 Rc 750° F 1.5 Hours
- Internal Stress Compressive
- Ductility Pass (ASTM B-571)
- 60,000 psi bond
- Melting Point 880° C
- Plating rate .0003-.0006 for life of bath
- Pass Nitric test and all ASTM B 117 tests
- RoHs and ELV pass (check with your vendor)

Advantages for you and your customers

- Excellent corrosion resistance
- No staining (yellow, brown or black)
- Excellent wear resistance, freedom from porosity on thickness of up to .003
- Constant quality throughout the life of the bath
- Tank stability
- Deposit in compression
- Natural lubricity, providing excellent release properties
- Consistent plating rate through out life of bath
- Increased production
- Self-polishing effect in molding operations
- Can replace stainless steel
- Can replace chrome
- Increase market share
- Easily waste treatable

Conclusion

- **Implementing proper equipment can save you money and pay for itself. By reducing poor deposits and increasing bath life and plating rate.**
- **Implementing proper pre-treatment for high phos EN bath will ensure long life, a true high phos deposit and reduce your reject rate.**
- **Knowing where your bath is at all times will ensure long life and a quality deposit.**
- **Knowing what your bath is doing through a strict QC program will also give you confidence that you can go after new customers (and keep the ones you have)**

Started with three 170 gallon tanks that were made improperly. Added two 450 gallons tanks with a gravity system for transferring.



Now has four 450 gallon tanks with all the proper equipment/transfer system and QC program and they have tripled their market share.



Thank You!

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