



MARYLAND  
**MMCC**

ICP-MS CONE MAINTENANCE  
FOR ENHANCED LIFETIMES



HUMBOLDT COUNTY BONG BEETLE

Lawrence Neufeld  
President/CEO Spectron, Inc



**1980's**

VG PQ1 ICP-MS '84

IBM PC '82

PLASMATRACE HR-ICP-MS '88

**1990's**

AGILENT 4500 BENCHTOP '94

PE ELAN 6100 DRC '99

**2000's**

**2010's**

Quality 

Google GLASS

GOOGLE GLASS '12

BOSTON DYNAMICS '17

TUBING

**SPECTRON INC**

## TOPICS FOR DISCUSSION



With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- HISTORY MATTERS
- TO CLEAN, OR NOT TO CLEAN
- WHAT WE ARE DEALING WITH
- FIRST DO NO HARM
- THE TRULY STRONG ARE ALWAYS GENTLE
- ELBOW GREASE
- CALL A FRIEND
- CONE GENEALOGY
- IT'S EASY BEING GREEN
- VALUE FOR MONEY

CONES



PIPE INTRODUCTION



TUBING



**SPECTRON**<sup>INC</sup>

**HISTORY MATTERS**

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- DAILY PERFORMANCE LOGS
- UNDERSTAND YOUR ANALYTICAL REQUIREMENTS
- CHANGE IS NOT ALWAYS GOOD
- SLOW AND STEADY WINS THE RACE

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[CONES](#) [ACCESSORIES](#) [SAMPLE INTRODUCTION](#) [TUBING](#)

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**SPECTRON** INC

DAILY PERFORMANCE LOGGING IS CRITICAL IN DETERMINING, AMONG OTHER THINGS, CONE PERFORMANCE. PARAMETERS SUCH AS VACUUM PRESURE, SIGNAL DEGRADATION, MASS REPSONSE AND STABILITY MAY ALL BE AFFECTED BY CONE DEGRADATION. ALTERNATIVELY, IF PERFORMANCE IS CONSISTENT WITH PREVIOUS GOOD RESULTS IT IS USUALLY BETTER TO LEAVE YOUR CONES ALONE.

**TO CLEAN OR NOT TO CLEAN** 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- FREQUENT CLEANING = SHORTER CONE LIFETIMES
- IF IT AIN'T BROKE, DON'T FIX IT
- CHOOSE THE BEST METHOD FOR YOUR APPLICATION
- BEAUTY IS IN THE EYE OF THE BEHOLDER


CONES      ACCESSORIES      SAMPLE INTRODUCTION      TUBING

 Learn More       Learn More       Learn More       Learn More

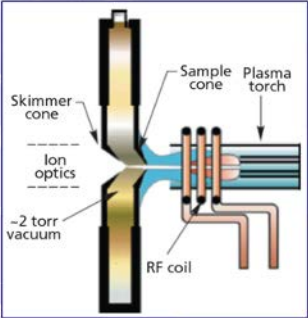
**SPECTRON** <sup>INC</sup>

FREQUENT, UNNECESSARY REMOVAL, CLEANING AND REINSTALLATION OF SAMPLE AND SKIMMER CONES INCREASE THE LIKELYHOOD OF DAMAGE, OR PREMATURE WEAR. UNDERSTAND YOUR APPLICATION'S REQUIREMENTS AND ACT ACCORDINGLY. CONES DO NOT NEED TO LOOK PRETTY TO PERFORM OPTIMALLY. DO NOT OVERCLEAN.

## WHAT WE ARE DEALING WITH




With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.



- 6,000-8,000 °C ARGON PLASMA
- WET VS DRY PLASMA
- ORGANIC VS INORGANIC
- GOOD CONTACT WITH INTERFACE
- EFFECTIVE INTERFACE COOLING
- CONE MATERIAL

SAMPLE INTRODUCTION

TUBING



AS WE KNOW THE ICP IS AN AGGRESSIVE ENVIRONMENT. CONE WEAR OCCURS THROUGH THERMAL AND CHEMICAL ABLATION AND THE RESULT OF VARIOUS CONE CLEANING TECHNIQUES. THIS CAN BE EXACERBATED BY SAMPLE MATRIX, OR POOR INSTALLATION AND CONTACT WITH THE WATER COOLED INTERFACE. ORGANIC MATRICES ARE PARTIUCULARLY HARD ON INTERFACE CONES

**WHAT WE ARE DEALING WITH**

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- THERE ARE AS MANY SKIMMER GEOMETRIES AS THERE ARE INSTRUMENT TYPES
- HOLDING THESE GEOMETRIES ARE CRITICAL TO GOOD PERFORMANCE

**SKIMMER CONES**

SAMPLE INTRODUCTION    TUBING

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THE SKIMMER CONE IS BOTH MORE DELICATE AND MORE UNIQUE, BASED ON THE OVERALL DESIGN OF EACH ICP-MS THAN THE SAMPLE CONE. THEY ALSO PLAY A GREATER ROLE IN THE GENERAL PERFORMANCE AND QUALITY OF YOUR DATA. MAINTAINING THE ORIGINAL DIMENSIONS OF THESE CONES INSURES CONTINUED PERFORMANCE.

**WHAT WE ARE DEALING WITH**

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- SIMILAR GEOMETRIES
- MORE ROBUST
- TAKE THE BRUNT OF THE ABUSE
- MORE "WORKABLE" MATERIAL

**SAMPLE CONES**

SAMPLE INTRODUCTION    TUBING

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THOUGH ALSO IMPORTANT TO PERFORMANCE, THE SAMPLE CONES ARE GENERALLY MORE SIMILAR IN DESIGN TO EACH OTHER. THEY ARE ALSO MORE ROBUST, HAVING MORE MATERIAL AT THE TIP. THIS ADDED MATERIAL ALSO MAKES THEM MORE SUITABLE TO REFURBISHING.



# WHAT WE ARE DEALING WITH




With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.




Phase Temperature

Core Temperature

- TIP TEMPERATURE & WEAR
- MAINTAIN GOOD CONTACT WITH INTERFACE
- IMPORTANCE OF A FUNCTIONAL COOLING SYSTEM

SAMPLE INTRODUCTION

TUBING



THE MODEL DISPLAYED REPRESENTS VARIOUS PARAMETERS THAT AFFECT TIP TEMPERATURE AND THEREFORE PERFORMANCE AND WEAR. GOOD OR POOR CONTACT WITH THE INTERFACE, POOR INTERFACE COOLING, ALTERNATE MATERIALS AND CONE MASS ALL PLAY A ROLE IN CONE TIP TEMPERATURE.

The banner features a central image of a nickel cone with a sample inside. Surrounding it are various Spectron cones and accessories. The text 'FIRST DO NO HARM' is prominently displayed in blue. To the right, a 'Quality' section with the Spectron logo states: 'With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.' Below this, a list of bullet points reads: '• NICKEL VS PLATINUM CONES', '• START GENTLY, BE PATIENT', and '• KNOW YOUR ENEMY (AND FRIENDS)'. At the bottom, there are four colored buttons: 'CONES' (purple), 'ACCESSORIES' (orange), 'SAMPLE INTRODUCTION' (light blue), and 'TUBING' (teal), each with a 'Learn More' link. The Spectron Inc. logo is at the bottom left.

## FIRST DO NO HARM

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- NICKEL VS PLATINUM CONES
- START GENTLY, BE PATIENT
- KNOW YOUR ENEMY (AND FRIENDS)

CONES ACCESSORIES SAMPLE INTRODUCTION TUBING

 Learn More  Learn More  Learn More  Learn More

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AS WITH LIGHT SOCKETS, NEVER STICK FOREIGN OBJECTS, ESPECIALLY METALIC ONES INTO THE CONE ORIFICE. THE ORIGINAL DIMENSIONAL TOLERANCES CANNOT BE HELD BY MANUAL MANIPULATION.

**"THE TRULY STRONG ARE ALWAYS GENTLE"\***



Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- **CLEAN CHEMICALLY, NOT MECHANICALLY**

Learn More

MPLE INTRODUCTION TUBING

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Learn More

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\*Yuuki Obata

THOUGH SOME MAY SUGGEST CLEANING EXCLUSIVELY WITH DH2O, IT IS MY EXPERIENCE THAT THIS WILL ONLY WORK FOR MILD SALT BUILDUP. FOR SEVERE BUILD UP OF SALT DEPOSITS AND ESPECIALLY REFRACTORY OXIDES, OR ORGANICS A SLIGHTLY MORE AGGRESSIVE APPROACH MAY BE NECESSARY.

**"THE TRULY STRONG ARE ALWAYS GENTLE"**

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- APPLY 2% HNO<sub>3</sub>
- LET SIT FOR 2-5 MINUTES
- RINSE WITH DIH<sub>2</sub>O
- 3% PEROXIDE SOAK FOR ORGANIC OR MIXED MATRICES



CONES

[Learn More](#)

SAMPLE INTRODUCTION

[Learn More](#)

TUBING

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FOR INORGANIC RESIDUE, START WITH A GENTLE APPLICATION OF 2% HNO<sub>3</sub>, WITH A COTTON SWAB, AT THE BACK AND FRONT OF THE CONE ORIFICE. LET SIT FOR 2-5', WIPE OFF RESIDUE WITH COTTON SWAB, THEN RINSE WITH DH<sub>2</sub>O. FOR ORGANIC OR MIXED RESIDUE START WITH 3% PEROXIDE SOAK FOR 15'-30'', THEN REMOVE RESIDUE WITH COTTON SWAB, OR CLOTH AND RINSE WITH DH<sub>2</sub>O. NEVER WIPE DIRECTLY ACROSS THE SKIMMER TIP. HOWEVER IF YOU CAN GET AWAY WITH A DH<sub>2</sub>O CLEANING PROCESS, DO IT.

**"THE TRULY STRONG ARE ALWAYS GENTLE"**


Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.



- SONICATE IN CITRANOX 10-15'
- SONICATE IN DH2O FOR 10'
- REFRESH DIH2O AND REPEAT
- BLOW DRY WITH N2 OR AR

CONES ACCESSORIES SAMPLE INTRODUCTION TUBING

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GENTLY PLACE CONE(S) INDIVIDUALLY IN GLASS BEAKER CONTAINING 2% CITRANOX SOLUTION AND SONICATE FOR 10-15', FOLLOWED BY SONICATION IN DH2O AND A FRESH DH2O RINSE. IF CONES ARE STILL OCCLUDED YOU MAY WANT TO REPEAT HNO3 APPLICATION BEFORE ATTEMPTING A MORE AGGRESSIVE APPROACH.

**BEAUTY IS IN THE EYE...Quality**

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- READY FOR INSTALLATION
- RUN PERFORMANCE TEST
- VERIFY PERFORMANCE

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TIP

INSIDE ANGLE

CONES

SAMPLE INTRODUCTION

TUBING

THE "ANALYTICAL ZONE" (1 CM AROUND ORFICE) IS THE IMPORTANT BIT, DON'T BE OVERLY CONCERNED WITH AESTHETICS.

NOTE: THIS CONE WAS PULLED FROM OUR RECYCLING BIN, THEREFORE SLIGHTLY DAMAGED.

## ELBOW GREASE

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- IF THE GENTLE FAILS
- SEVERAL COMMON TOOLS
- PRETREAT FIRST [Learn More](#)
- LAST RESORT

[Learn More](#) [Learn More](#) [Learn More](#) [Learn More](#)

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IF CHEMICAL CLEANING IS UNSUCCESSFUL AT REMOVING MATERIAL OCCLUDING THE ORIFICE OF THE SAMPLE, OR SKIMMER CONE THERE ARE WAYS TO GENTLY CLEAN MECHANICALLY.

## ELBOW GREASE

Quality

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- REFRACTORY BUILD UP
- PERSISTENT CONE OCCLUSION
- GENTLE TECHNIQUE FAILED

SAMP

**SPECTRON** INC

HIGH PURITY FINE ALUMINA POWDER, OR DIAMOND PASTE IS RECOMMENDED, BUT MANY HAVE USED BON-AMI™, OR SIMILAR CLEANING ABRASIVES. CREATE A PASTE ADDING DH<sub>2</sub>O TO ABRASIVE POWDER AND FIRST CLEAN THE INSIDE ANGLE OF THE CONE BY APPLYING PASTE WITH A COTTON SWAB. THE TOP ANGLE (TIP) OF THE CONE, ESPECIALLY THE SKIMMER CONE REQUIRES A MORE DELICATE APPROACH. WITH COTTON SWAB, OR GAUZE APPLY PASTE TO TOP ANGLE BUT NEVER APPLY PRESURE DIRECTLY ON TIP.



**ELBOW GREASE**

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- RINSE OFF EXCESS POWDER
- SONICATE IN BEAKER OF DH2O
- REPLACE DH2O AND REPEAT
- INSURE ALL ABRASIVE POWDER IS REMOVED

CONES ACCESSORIES SAMPLE INTRODUCTION TUBING

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FOLLOWING A THOROUGH RINSING WITH SQUIRT BOTTLE, OR EQUIVALENT, PLACE CONES IN BEAKER OF DH2O AND SONICATE FOR 5-10', THEN REPEAT WITH FRESH DH2O. DRY WITH N2, OR AR

**CALL A FRIEND**

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- NICKEL CONES ONLY\*
- REFRACTORY BUILD UP
- CONE OCCLUSION [Learn More](#)
- HIGH RISK OF DAMAGE

[Learn More](#)

[Learn More](#)

[Learn More](#)

[Learn More](#)

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THERE MAY BE TIMES WHEN COMPLETE REMOVAL OF OCCLUSIONS ENDANGER THE INTEGRITY OF CONE GEOMETRIES. FOR PLATINUM CONES THERE IS AN ALTERNATIVE, CONE REFURBISHING. USING SIMILAR TECHNIQUES TO THE MANUFACTURING PROCESS IT IS POSSIBLE TO BRING CONES BACK TO ORIGINAL, OR NEAR ORIGINAL CONDITION. HOWEVER IT IS ONLY COST EFFECTIVE FOR PT CONES.

The advertisement features a central graphic with two circular images showing the cross-sections of platinum cones. The top image shows a cone with a dark, irregular ring, while the bottom image shows a cone with a clean, bright ring. The background is a light blue and white gradient with faint images of platinum cones and the SPECTRON logo.

## CALL A FRIEND

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- POOP HAPPENS
- CANNOT ADD MATERIAL
- CAN REFORM/RE MACHINE
- PT CONES ONLY

CONES [Learn More](#)

SAMPLE INTRODUCTION [Learn More](#)

TUBING [Learn More](#)

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PLATINUM REFURBISHING CAN ALSO CORRECT DAMAGE CAUSE BY SLIPPERY FINGERS. IF THERE IS SUFFICIENT MATERIAL, CONES CAN OFTEN BE REFORMED AND RETURNED TO THE ORIGINAL GEOMETRIC TOLERANCES.

**CALL A FRIEND**

Quality  INC

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- SEVERELY ANNEALED
- MATERIAL IS BRITTLER
- MAY NOT BE REPAIRABLE
- REFRACTORY OXIDES CAN BE REMOVED HOWEVER

CONES

SAMPLE INTRODUCTION


TUBING

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HOWEVER THIS MAY NOT BE POSSIBLE IF THERE IS NOT ENOUGH MATERIAL TO WORK WITH, OR IF THE PT IS SEVERELY ANNEALED



**CONE GENEALOGY**

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- THE IMPORTANCE OF DEEP ENGRAVING
- MUST LAST THE LIFETIME OF A PLATINUM CONE
- COMPLETELY TRACEABLE

SAMPLE INTRODUCTION      TUBING

**SPECTRON**<sup>INC</sup>

IN ORDER FOR OUR CONES TO BE COMPLETELY TRACEABLE IT BECAME NECESSARY TO ENGRAVE SERIAL NUMBERS DEEP ENOUGH TO WITHSTAND YEARS OF CHEMICAL AND THERMAL ATTACK.

## CONE GENEALOGY

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- DEEP CNC MARKING
- BIRTH TO DEATH TRACKING
- WHO, WHAT, WHERE, WHEN

SN: CV391  
 PN: G1833-65132  
 Pt Lot#: PTRH300-72629  
 Mfg. Lot#: PM-N745-11  
 Mfg date: 05/15/2014  
 Sold: 7/21/2014  
 Photo: 4/06/2016  
 Customer in MN.

**SPECTRON**<sup>INC</sup>

COMBINED WITH OUR ARCHIVING OF ALL PT LOTS PURCHASED, WE CAN TRACE BACK ALL INFORMATION ON THE MANUFACTURE OF EACH CONE, REGARDLESS OF CONDITION.

**VALUE FOR MONEY**

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

CK176  
 MFG Lot#: PM-M561-05  
 Pt Lot#: PTRH472-72425  
 MFG: October 2013  
 Refurbished: October 2019



- A PT CONE CAN LAST YEARS
- PT CONES RUNS CLEANER
- REQUIRES LESS MAINTENANCE
- HIGHER THROUGHPUT
- PT:NI COST  $\cong$  4:1

SAMPLE INTRODUCTION      TUBING

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MOST PT CONES CAN BE REFURBISHED MULTIPLE TIMES AND STILL BE TRACED BACK TO THEIR ORIGIN. FOR MANY USERS PT CONES MAY ACTUALLY BE MORE COST EFFECTIVE THAN NI CONES.

**HAPPY TO DO IT**

Quality 

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

- **REGULAR AND OFTEN FREQUENT PT REFURBISHING**
- **BETTER US THAN YOU**
- **QC CHECK FOR TOLERANCE**

W1033614 TOP      W1033614 BOTTOM

W1026907 TOP      W1026907 TOP 8X

SAMPLE INTRODUCTION      TUBING

**SPECTRON**<sup>INC</sup>

IT IS NOT UNCOMMON FOR OUR CUSTOMERS TO SEND BACK THEIR PT CONES FOR FREQUENT REFURBISHING, RATHER THAN RISK CLEANING THEM THEMSELVES, OR TO REPAIR FOR MINOR ISSUES. BOTH UPON RECEIPT AND FOLLOW REFURBISHING SPECTRON INSPECTS ALL CONES AND CHECKS THEIR DIMESIONAL TOLERANCES.





ITS EASY BEING GREEN Quality 

What's in Your Drawers?

**SPECTRON**  
*green*

CONES ACCESSORIES

<https://spectronus.com/news/refurbish-reclaim>



**SPECTRON**<sup>INC</sup>

With a solid background in ICP-MS and ICP-OES techniques, we bring a unique level of expertise to the manufacturing process.

THOUGH WE CAN'T COST EFFECTIVELY REFURBISH YOUR NI CONES WE HAVE A RECYCLING PROGRAM. SEND US YOUR NI CONES AND WE WILL ADD THEM TO OUR NI RECYCLING STREAM, THEN GIVE YOU CREDIT BACK. FOR MORE INFORMATION GO THE LINK SHOWN ON THIS SLIDE.

