

Austin AI - HQ
Rick COMTOIS President & CEO
Innovators in Sensor - Based Sorting/Process Solutions

XRF - LIBS - THz



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LIBS based sensor sorting

Why do Aluminum recyclers need **LIBS**?

Aluminium is infinitely recyclable
That not only helps but obliges us to recycle!

Aim for THE GREEN Aluminium! It is Sustainable!

Recycling Aluminium means **95% energy saving**
compared to Aluminium primary production.



LIBS is the newest generation, chemistry based *precise* sensor sorting technology



Austin AI - LIBS based sensor sorting

Modular Design

- Feeders
- Patented chute arrangement
- LIBS module
- Algorithms

LIBS based sensor sorting

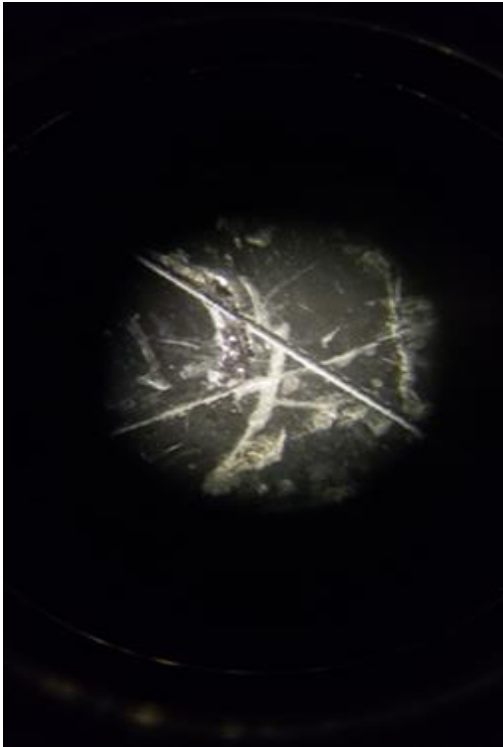


CHUTE

A sensor chute transport, part of the bespoke and patented system. Engineered for the specific material size of infeed scrap to ensure the exact passage of piece through Laser focal point.

LIBS based sensor sorting

The Power of High Powered, High Frequency Fixed Optics



**Coated Material—LIBS etches
down to bare metal for
coatings, like:**

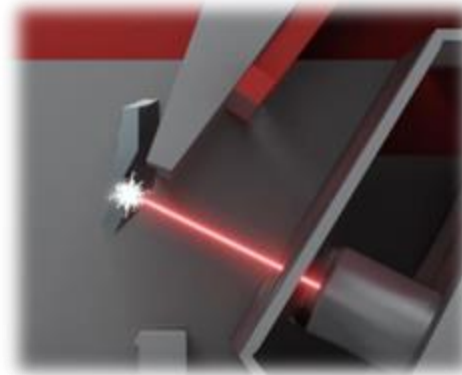
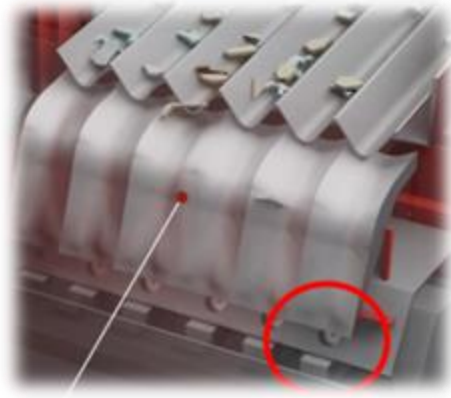
**Painted Material
Corroded Material
Polymer Material**



LIBS based sensor sorting

Free fall vs belt type design

TWO-STAGE VIBRATORY FEEDING and the CHUTE provided FREE FALL design



NO CAMERA to detect piece position and image singularity

NO ARTIFICIAL INTELLIGENCE to estimate piece shape



More detected/analyzed pieces > higher yield & higher purity



LIBS based sensor sorting

Real analytics - no Artificial Intelligence

→ we can sort as low as:

<0.1% Mn,

<0.2% Mg,

<0.2% Si,

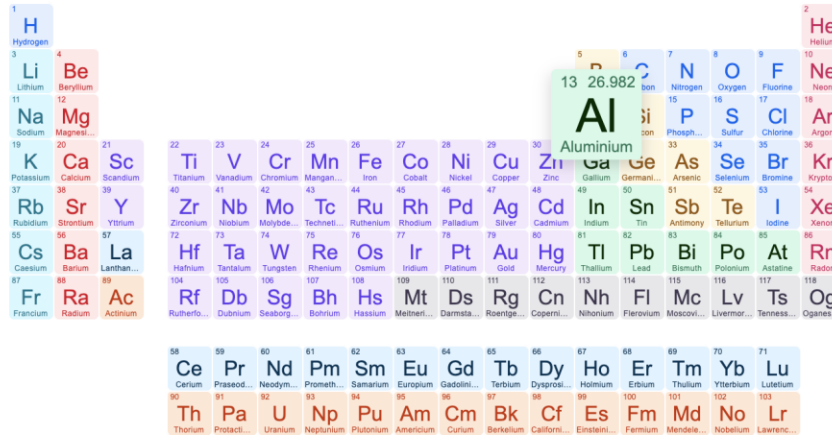
<0.1% Zn,

<0.15% Fe

<0.1% Cu

.... and more!!!

Periodic Table

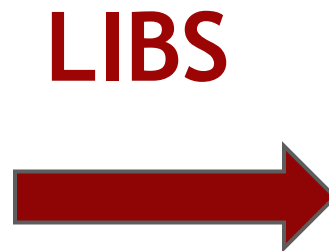


Unlimited number of elements can be set as sorting criteria.

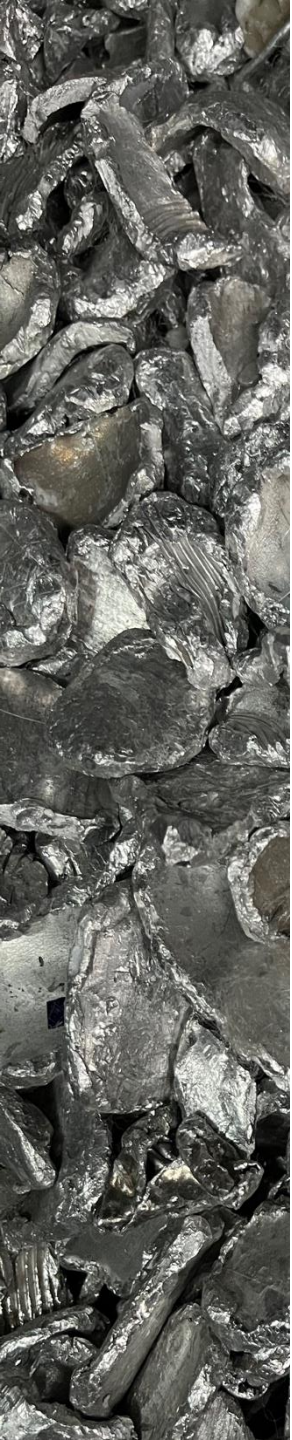
! High flexibility ! Best analytical performance

LIBS based sensor sorting

READY TO MELT FRACTIONS PRODUCED



The #1 cost for recycling Aluminium is not the net cost of the Al Alloy itself, it is the cost of melting and correcting the molten metal.



LIBS based sensor sorting

READY TO MELT FRACTIONS PRODUCED

In conclusion if you would like to produce a 6063, -for example- then you need to sort via LIBS, and all that remains is melt and test.

- ▶ No corrections
- ▶ No additions
- ▶ No subtractions
- ▶ Save a lot of fuel and time per lot
- ▶ *AND* save a lot of \$\$\$ per ton



LIBS based sensor sorting

Proven applications - sortation by chemistry

Extraction/Sorting of:

- * Mg Alloy from Mixed Light Fraction (Twitch/Zorba)
 - * Wrought ALU Alloys from Cast ALU Alloys (adjusted Si <0.2-12+%)
 - * 6xxx // 5xxx series from ALU Alloy Scrap
 - * 6063 // 5052 from Mixed ALU Wrought Scrap (Cr! <0.1%)
 - * as low Mn Alloy as 0.06% out of 6xxx series ALU Alloy Scrap
 - * High Cu Cast ALU Alloy from as Low as <0.1% Cu Cast ALU Alloy
 - * High Fe Cast ALU Alloy from Low 0.1% Fe Cast ALU Alloy
- ...and many more ☺



LIBS based sensor sorting

Sorting 6082 from 6063 in Mixed Al Wrought Scrap

	6063	6082
Al	base	base
Si	0.2-0.6	0.7-1.3
Mg	0.45-0.9	0.6-1.2
Mn	«0.1	0.4-1.0
Cr	«0.1	0,25
Fe	0-0.35	«0.5
Cu	«0.1	«0.1
Zn	«0.1	«0.2
Ti	«0.1	«0.1

Enough to set Manganese: <0.4%



LIBS based sensor sorting

Further, melt test proven applications

Taint tabor. Extraction: $>0.09\%$ Cu and $>0.4\%$ Si (matrix dependent)

Tense with magnesium or magnesium cast alloy . Extraction: a) pure Mg / b) Mg cast alloy.

1050: Si <0.25 /Fe <0.40 /Cu <0.08 /Mn <0.08 /Mg <0.2 /Zn <0.10 (wt%)

3003, 3004: Si <0.60 /Fe <0.7 /Cu:0.08-0.20/Mn:1.0-1.5/Mg: - /Zn <0.10 (wt%)

5052, 5182: Si <0.20 /Fe <0.40 /Cu <0.10 /Mn:0.20-0.5/Mg: 4.0-5.0/Zn <0.25 (wt%)

7N01: Si <0.30 /Fe <0.35 /Cu <0.20 /Mn:0.20-0.70/Mg: 1.00-2.00/Zn:4.0-5.0 (wt%)

ADC12: Si:9.6-12:0/Fe <1.30 /Cu:1.50-3.50/Mn <0.50 /Mg <0.3 /Zn <1.0 (wt%)

Separate: 6063, 6061, 6116 together

Si: 0.20-0.60/Fe <0.35 /Cu <0.10 /Mn <0.10 /Mg: 0.45-0.90/Zn <0.10 (wt%)

Mid-cut: 40 - 120 mm (median: >80 mm)

Material must be dry and free from excess oil and grease

Efficiency of Extracted Material: $>80\%$

Purity of Accept Material: $>95\%$

This slide needs formatting
I will do that later today

LIBS based sensor sorting

Performance test - example

Yield %

FINAL TEST 4	SEPT 24		100% feeder										
Recept/anyd	1070	1100	2017	3003	5052	6005	6061	6063_sim	6063_anc	7050	ADC12	eject [%]	
1070	35/5	0/	0/	0/	0/	0/	0/	0/	0/	0/	0/	87,5%	
1100	0/	39/1	0/	0/	0/	0/	0/	0/	1/37	0/	0/	97,5%	
2017	0/	0/	38/2	0/	0/	0/	0/	0/	0/	0/	0/	95,0%	
3003	0/	0/	0/	35/4	0/	0/	0/	0/	0/	0/	0/	89,7%	
5052	0/	0/	0/	0/	40/40	0/	0/	0/	0/	0/	0/	100,0%	
6063	0/	0/	0/	0/	0/	38/1	0/	34/5	37/3	0/	0/	92,4%	
6063 YKK	0/	0/	0/	0/	0/	0/	0/	0/	0/	0/	0/	0,0%	
6xxx	0/	0/	0/	0/	0/	39/0	34/5	36/3	39/1	0/	0/	94,3%	
7050	0/	0/	0/	0/	0/	0/	0/	0/	0/	35/5	0/	87,5%	
ADC12	0/	0/	0/	0/	0/	0/	0/	0/	0/	0/	10/1	90,9%	



LIBS based sensor sorting

Performance - TPH, purity, yield, PSR

	What we claim	Where it can go	What some customers do
PSR median	80 mm	>>80 mm	>>80 mm
Type of infeed	Wrought	Cast / Zorba	profile
Purity of extract	>>95%	Always >>95%	100%
Yield	>>85%	customers' choice Up to 10	65%
Throughput (TPH)	+/- 4.0		>5.0

LIBS based sensor sorting **Austin AI**



- 6063 -
4.0 TPH
100% purity
90% yield



LIBS based sensor sorting

! AAI LIBS ! KEY ADVANTAGES !

- * Typical Throughput (by Piece Size Range) of:
 - Mid-cut (40 - 120/140mm): ~0.8 tons/hr...per sensor; ~5 TPH per kit
 - Each system has allocations for 1 - 6 sensors per system
- * Very Low Downtime - 1 laser down only reduces throughput by ~15%
- * Reliability - NO conveyor belts; optics; relays
- * Robust - works well in industrial environments; few moving parts
- * Small footprint!
- * Paints, thin coatings, labels, dirt, moisture usually are not a problem
- * Low Cost of Operation - as low as \$0.04 US per kg of material processed based on fully loaded accounting costs of cash, equipment, operation, and labor. WE CAN PROVE THIS!!

Austin AI LIBS

Facts...

- We have customer who ordered their 3rd AAI LIBS system in 2023 and more users who consider the 2nd system to order.
- We have learned from our customers RoI data less than 2 years.
- We have users who successfully trade with carbon credit due to processing Alu scrap with AAI LIBS.
- More users line the LIBS sorted fractions directly to their furnace (proven 100% purity!!)



Austin AI LIBS

Latest and Greatest - New from the Lab

- 0.03% Cu increments in the range of 0.08-0.20% Cu / Al alloy
- 0.03% Mn increments in the range of 0.08-0.20% Mn / Al alloy
- Ni: 4% to 12% in Stainless Steel
- Zr in Al Alloy Base: 0.00% through 0.25%
- Removal of Zinc/Zn Alloys from Aluminum Alloys: >95%

Austin AI LIBS

Latest and Greatest - New from the Lab

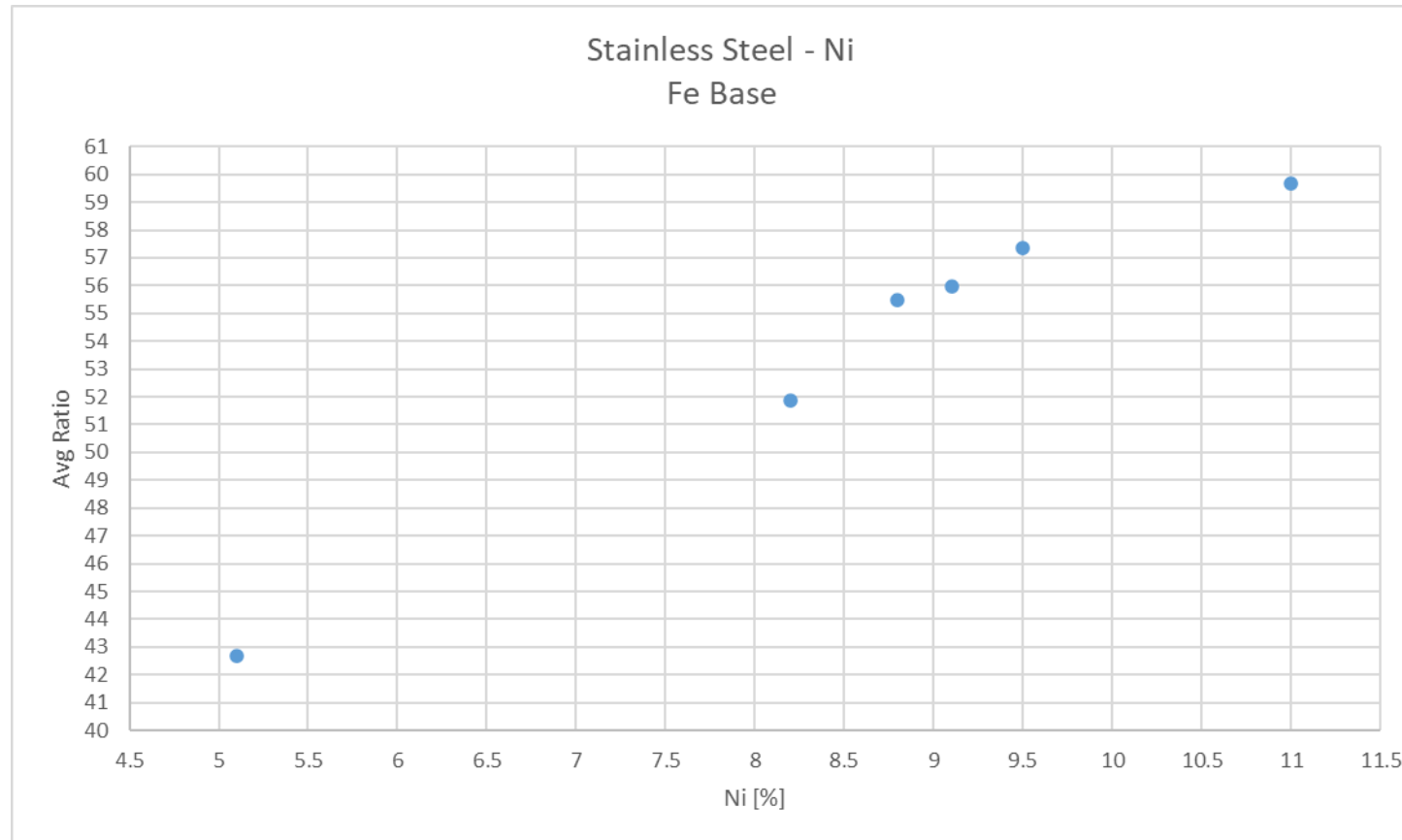
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Need
data

Austin AI LIBS

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Austin AI LIBS

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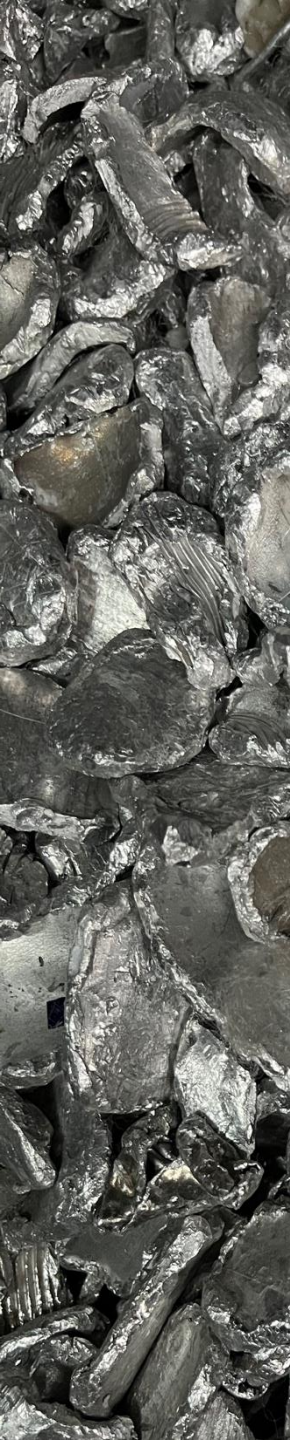
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Need
data



LIBS based sensor sorting

- 😊 **SIMPLICITY**
- 😊 **FLEXIBILITY**
- 😊 **BEST ANALYTICS**
- 😊 **POWERFUL PERFORMANCE**
- 😊 **NO ARTIFICIAL INTELLIGENCE USED**
- 😊 **BEST VALUE for MONEY**
- 😊 **HIGHEST NUMBER IN USE WW**
- 😊 **BEST ROI**
- 😊 **RELIABLE SERVICE SUPPORT**



LIBS based sensor sorting

**Austin AI are the World's Leader
in installed LIBS based Sensor
Sorters...>30 Worldwide!!**



WE ♥ LIBS

THANK YOU!

Q & A

LIBS based sensor sorting

Melt Test Results - example

jó

TEST	Sample ID	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti
#1	Infeed	0,7680	0,2930	0,3030	0,1960	0,0620	0,0100	0,0090	0,3110	0,0152
Eject No.1	E Mn 01	0,4660	0,2840	0,0390	0,0550	0,0220	0,0050	0,0020	0,1810	0,0085
Eject No.2	E Mn 01	0,4220	0,2320	0,0396	0,0498	0,0599	0,0055	0,0059	0,1850	0,0126
Drop No.1	D Mn 01 N:1	0,8980	0,2910	0,1530	0,2810	0,1100	0,0110	0,0130	0,2530	0,0180
Drop No.2	D Mn 01 N:2	0,9070	0,3100	0,2980	0,3220	0,1280	0,0120	0,0160	1,0910	0,0175
#2	Infeed	0,7680	0,2930	0,3030	0,1960	0,0620	0,0100	0,0090	0,3110	0,0152
Eject	E Cu 5	0,4830	0,2260	0,0440	0,0670	0,0410	0,0050	0,0020	0,0910	0,0127
Drop	D Cu 5	0,9250	0,3030	0,1930	0,2210	0,0600	0,0090	0,0220	1,1580	0,0165

#1) Mn < 0.1%

#2) Mn < 0.1%, Cu<0.5%, Fe<0.25%, Zn<0.1%,