Recovering **your** precious metals since 1919

Manufacturing Automation & Recycling

Challenges of Hydrogen Fuel Cell Recycling
From a Secondary Processor's Perspective

GANNON & SCOTT

Recover more Worry less

1. Background of Gannon & Scott capabilities and processes

2. Highlight H2 Recycling Today

3. Role of a Secondary Processor vs. Refiner

4. Advantages & Challenges of Processing Hydrogen Fuel Cell Industry Scrap

5. Questions & Discussion

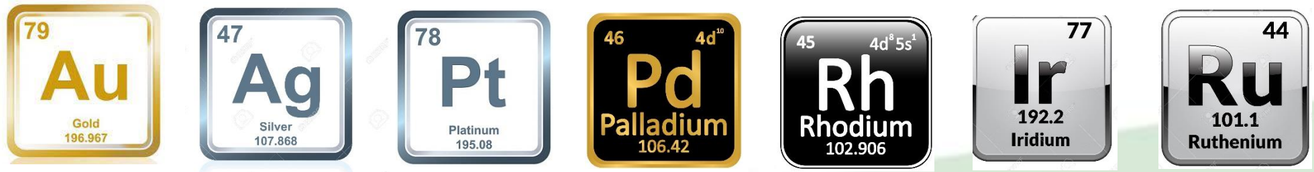
Recovering your precious metals since 1919

100+ years of experience

4th Generation, family owned, private company

Advanced Equipment and Technology

Precious Metals We Recover:



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PROCESSSING CAPABILITIES

Thermal Reduction

Filters, Fuel Cells, Resins, Wipes, Factory Debris, E-Scrap

Largest PM Incineration Capacity in the U.S.

Melting

High Grade Industrial Scrap, Cathodes

Chemical Processing

Cyanides, Acids, Non-Regulated

Laboratory Services

ISO:9001 Certified, Fire Assay & Classical Wet Chemistry

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TRuH$_2$

PGM Recovery Process for the Hydrogen Fuel Cell Industry

Proprietary Pre-Treatment

Incineration/ Thermal Reduction

Milling & Screening

Blending & Sampling

Assay Analysis

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TRuH_2 & Tru3Tec System

Maximum **NET** recovery utilizing our Tru3Tec custom designed Thermal Reduction System. Our proprietary, enclosed furnace design allows us to control the air flow, process speed and burn temperature AND process material in an environmentally responsible and sustainable way.

Pre-Treatment & Incineration eliminates hazardous materials & reduces organics:

Broad Spectrum of Electrolytes

Phosphoric Acid - Potassium Hydroxide - Acetic Acid

Array of Polymers & Elastomers

Adhesives used to bond plates & membranes

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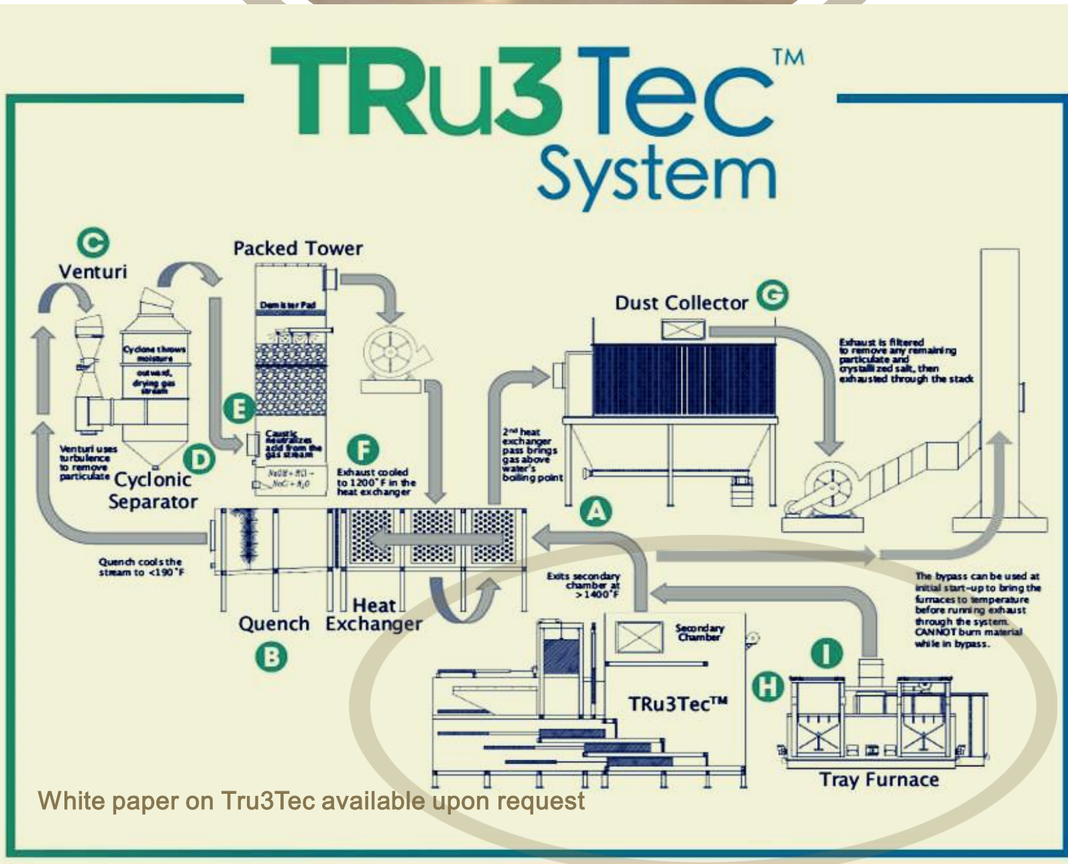

Note on
“FULL PROCESSING”

Gannon & Scott processes
100% OF ALL MATERIAL WE RECEIVE

We do not

Stream Sample

Chop Sample

2%-5% Grab Sample

INCONSISTENT *INACCURATE* *NOT REPEATABLE*

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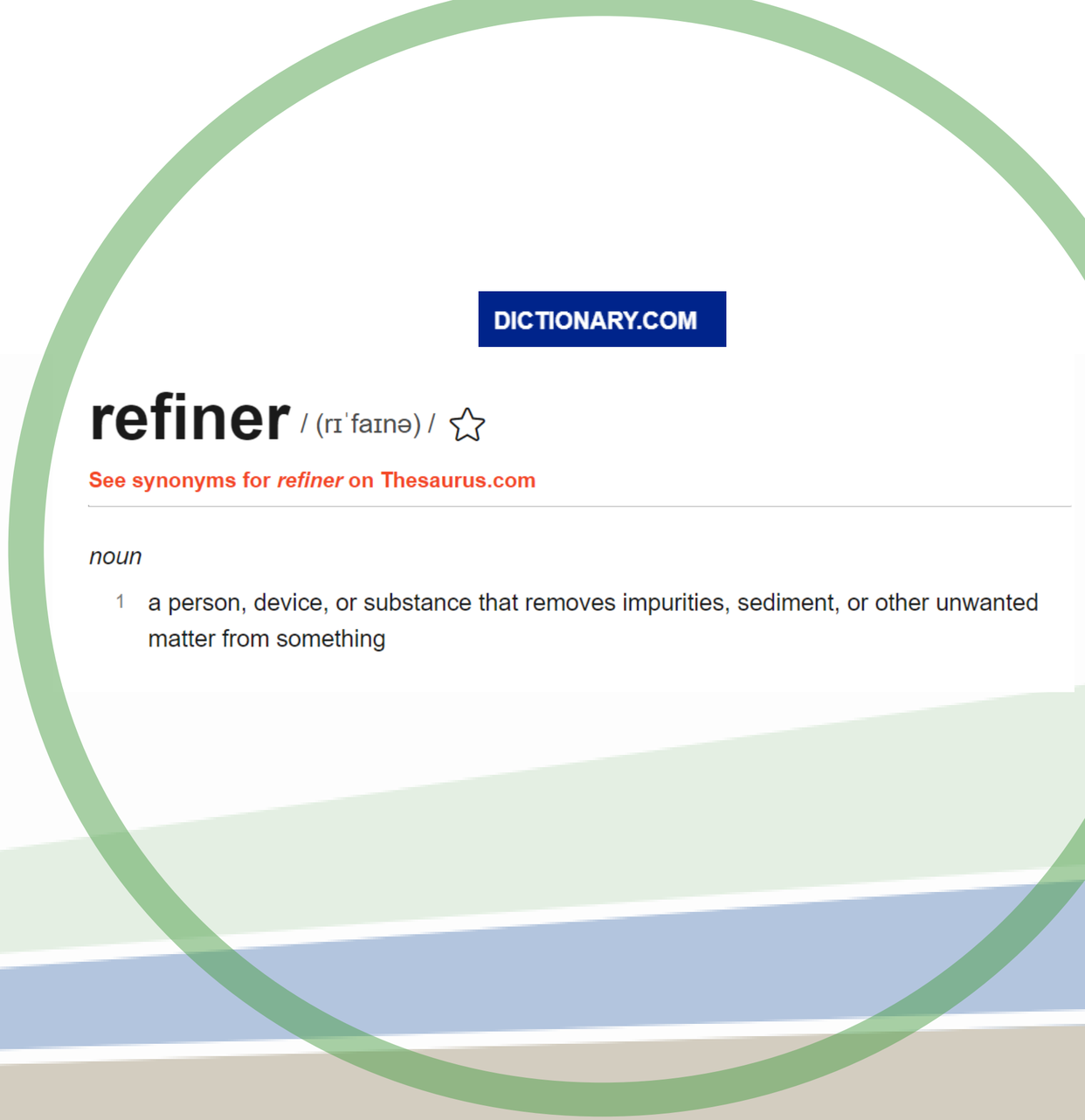
Secondary Processing

Vs.

Refiner



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Gannon & Scott's Role as a "Secondary Processor"

Fully Process Material

Sample & Analyze
for precious metal content

Pay the customer
based on the assay analysis

Market the prepared commodity globally

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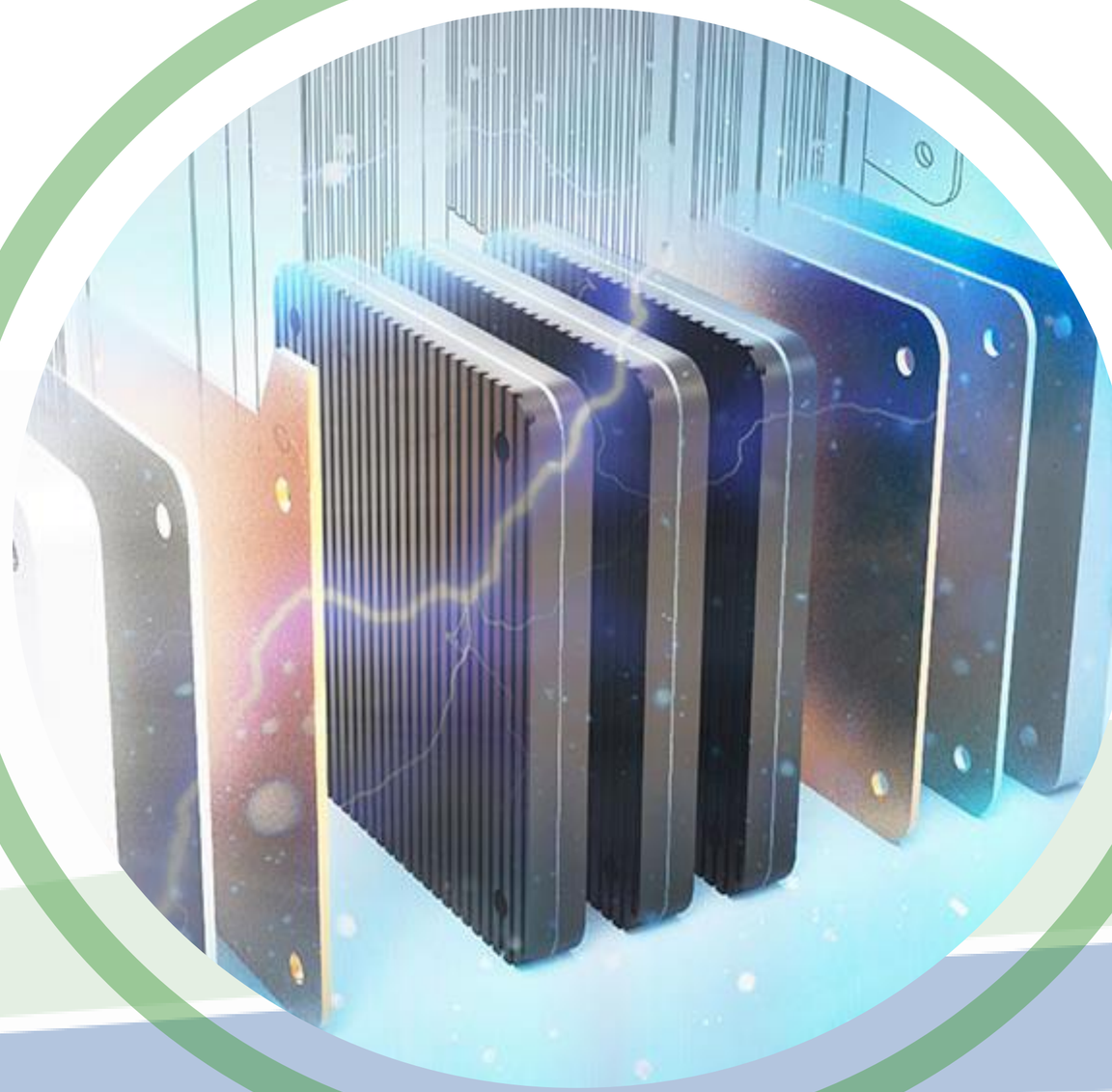
For This Discussion,
2 Main Types of H2 Recycling

End-of-Life

Manufacturing Waste



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End-of-Life

Limited - Newer Technology

Current Material Flow:

Manufacturers Directly

Mixed with Manufacturing Waste

Scrap Metal Recyclers

Auto Salvage

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End-of-Life

IMPORTANT

Future Discussion

revolving around the salvage & recycling industry for end-of-life

Educate

Assist

Facilitate

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Manufacturing Waste

Pt – Ir - Ru

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Manufacturing Waste

Membranes
Anodes & Cathodes
Trim Scrap
Platinum Black
Containers & Packaging
Wipes, Rags, PPE

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ADVANTAGES

of a “Secondary Processor” in Hydrogen Fuel Cell Recycling

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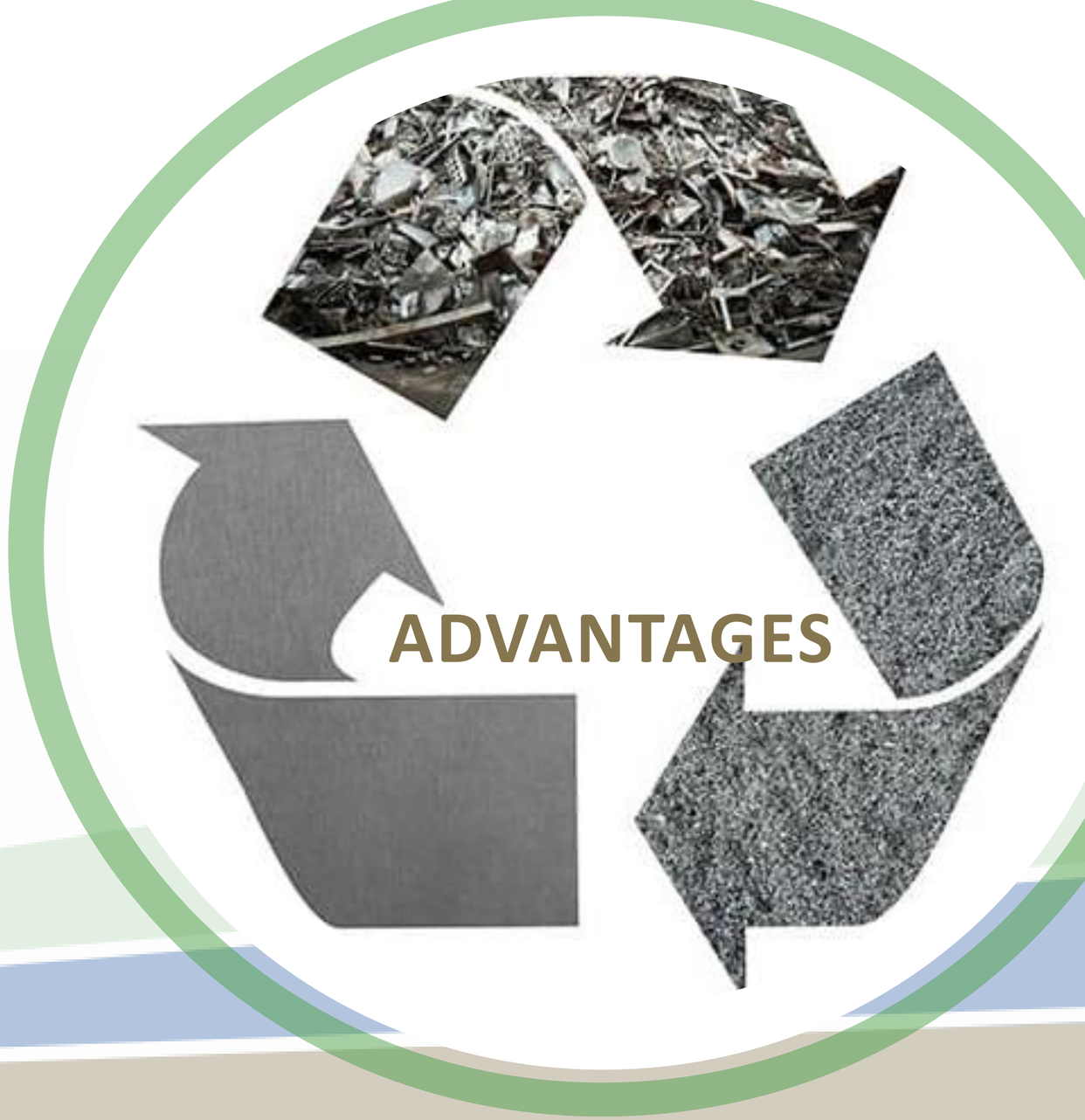

Able to handle H2 material in its raw form

Able to receive & process HAZARDOUS MATERIALS

Quick Turn-around for processing & payment

Ability to support multiple closed-loop recycling programs

Able to Handle & Segregate Smaller Lot sizes

Create a uniform & homogeneous commodity

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CHALLENGES

of a “Secondary Processor” in Hydrogen Fuel Cell Recycling

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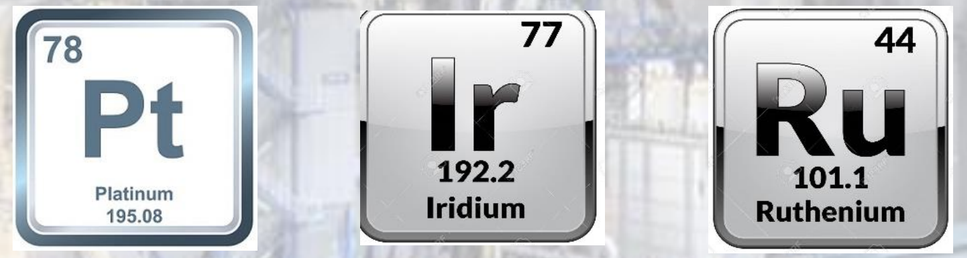
CHALLENGES

**Global Refiner or End-user able (or willing) to recover ALL 3 PGMs*



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CHALLENGES

Each Manufacturer has a different “Formula”

Ratio of Precious Metals, differences in Electrolytes, different Plate material for anodes & cathodes, etc.

Requires Flexibility and Expertise

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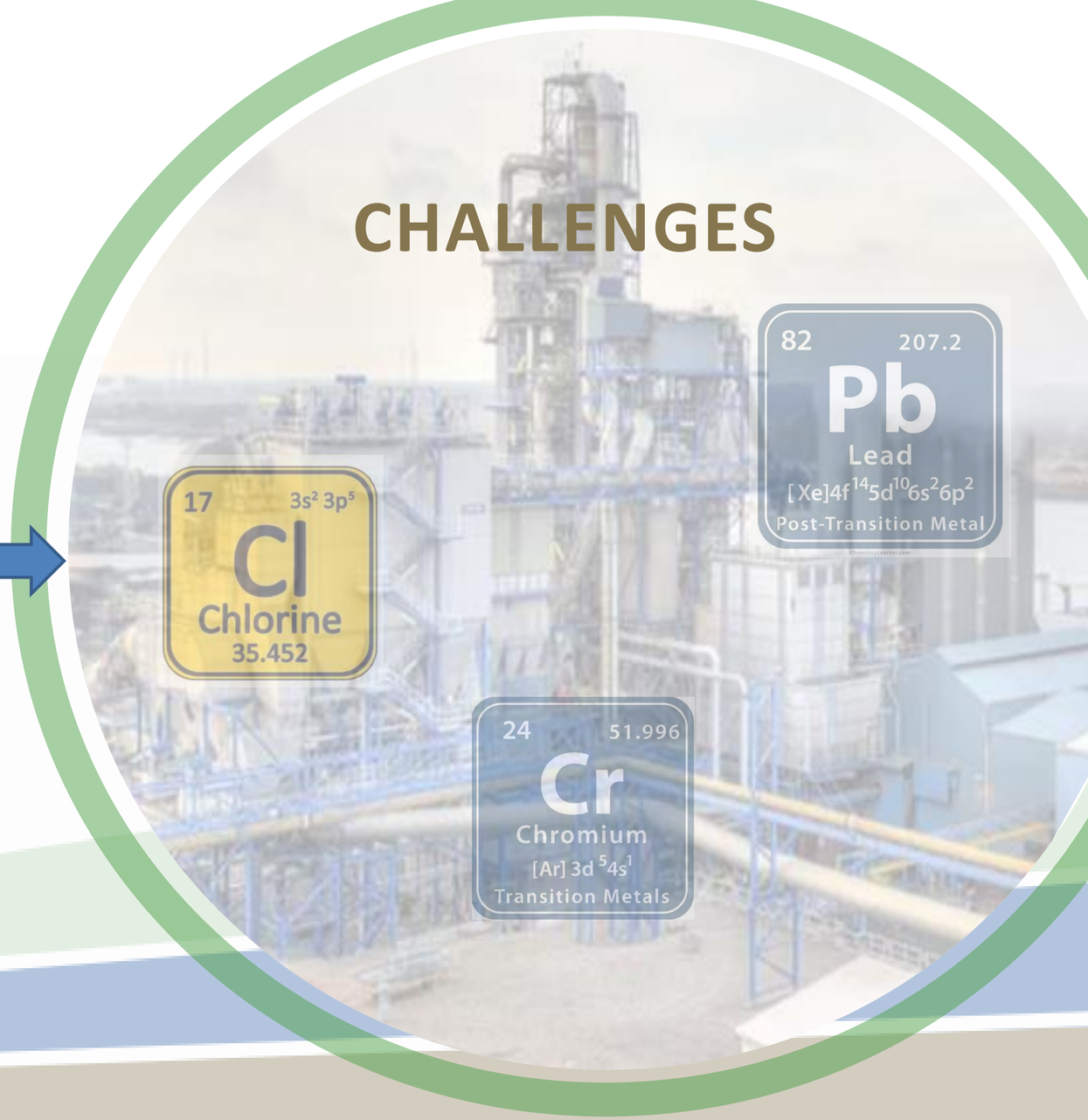
CHALLENGES

Global Refiner willing to take in the material based on deleterious elements:

(Low levels of Chlorides, Lead, Chromium, Etc.)



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Questions & Discussion

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Thank you

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