



Annual General Meeting
24 November 2016

Presentation by
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Austpac Activities 2015-2016



- **Developments at the Newcastle Plant**
- **Opportunities in the USA**
- **ERMS SR Licence in Asia**

Austpac's Newcastle Site





THE NEWCASTLE ZINC & IRON RECOVERY PLANT (NZIRP)

Improved technical capabilities

- **Alternative process options**
- **Additional product options**

Project History

- The **Newcastle Iron Recovery Plant (NIRP)** concept was conceived in 2011 and advanced through 2015 using a combination of funds from Kronos and Austpac – total \$20M spent to date
- Objective: to use Austpac's acid regeneration & iron reduction processes to commercially recycle steel mill oxide waste (mill scale & furnace dusts) and spent pickle liquor (SPL)
- NIRP was 85% complete at end of 2014; further \$6.8M sought. However the Plant was limited to processing **zinc-free** furnace dusts
- 2015 – Introduced electric induction furnace (EIF) to produce higher value pig iron; created potential to recover zinc from steel industry dusts
- The **Newcastle Zinc & Iron Recovery Plant (NZIRP)** concept was developed

2015-2016 Activities

- **Austpac's chloride-based process recovers Fe and HCl from mill scale and SPL. Recovering Zn from contaminated furnace dusts greatly improves Plant profitability**
- **Investigated feasibility of incorporating zinc chloride electrolysis into the NIRP flowsheet**
 - **Processes at early stage & required significant development**
 - **Other alternatives technically feasible but too expensive**
- **Developed a way to recover zinc from furnace dust using existing proven technology at NZIRP - two product options:**
 - **Zinc oxide – high grade feedstock for zinc refineries**
 - **Zinc metal – zinc sulfate electrolysis process used in Zn refineries**
- **Patent application lodged – 1st November 2016**

Newcastle Zinc & Iron Recovery Plant

- Global increase in recycling of steel
- More steel is galvanised (e.g. cars) and recycled
- Therefore more ZnO in contaminated waste dusts
- Existing processes to treat waste dusts only recover ZnO
- NZIRP process generates pig iron – taking advantage of the pelletised form of iron oxide, plus in-situ production of char, to enable conversion to pig iron
- NZIRP is able to process wide range of dusts

Steel Industry Furnace Dusts

➤ Primary steel making

- Blast furnace dusts Fe Oxide & 0-5% Zn
- BOS dusts Fe Oxide & 2-15% Zn

➤ Secondary steel making – Electric Arc Furnaces (EAF)

Zn content in EAF dust (EAFD) depends upon feedstock:

- Zn coated steel scrap generates dusts with up to 40 % Zn
- Furnace dusts are a significant zinc & iron resource
- Waelz recycling process produces a zinc calcine (60% Zn) used in zinc refineries; does not recover Fe metal

Electric Induction Furnace (EIF)

- Used in foundries worldwide; well-proven technology
- Off-gas rich in zinc; can be recovered as zinc oxide

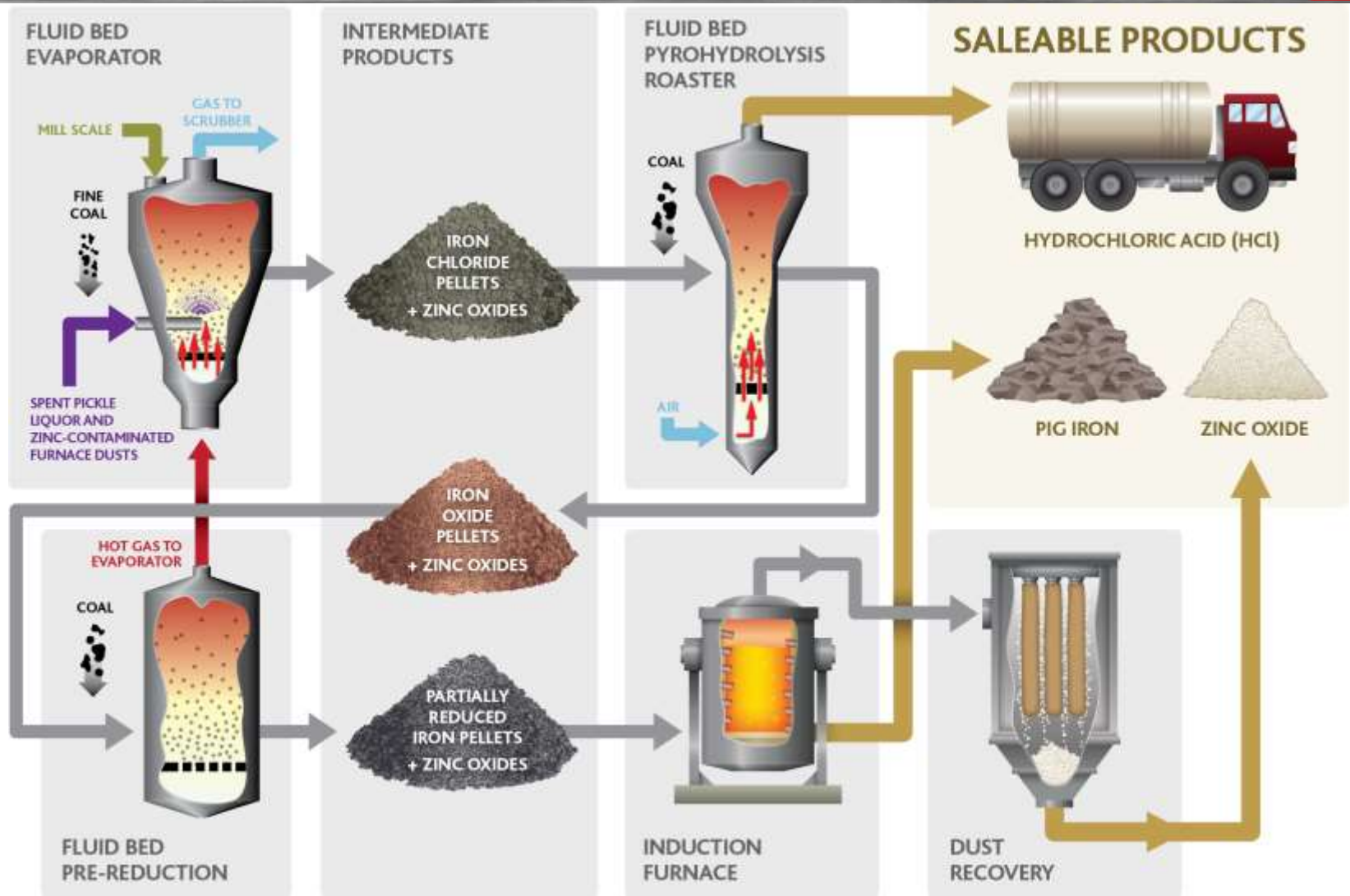


Newcastle Zinc & Iron Recovery Plant

NZIRP revised concept (2016):

- Two-stage project will reduce the initial capital requirement and reduce process risk by using proven technology
- **Stage 1 ZnO-Fe-HCl recovery**
 - Use an ELF to produce pig iron from pre-reduced iron oxide pellets
 - Use a baghouse to recover zinc oxide from the ELF off-gases
- **Stage 2 Zn-Fe-HCl recovery**
 - Further process the zinc oxide by using conventional zinc sulfate electrolysis to produce zinc metal

NZIRP Stage 1- Process Flow Diagram

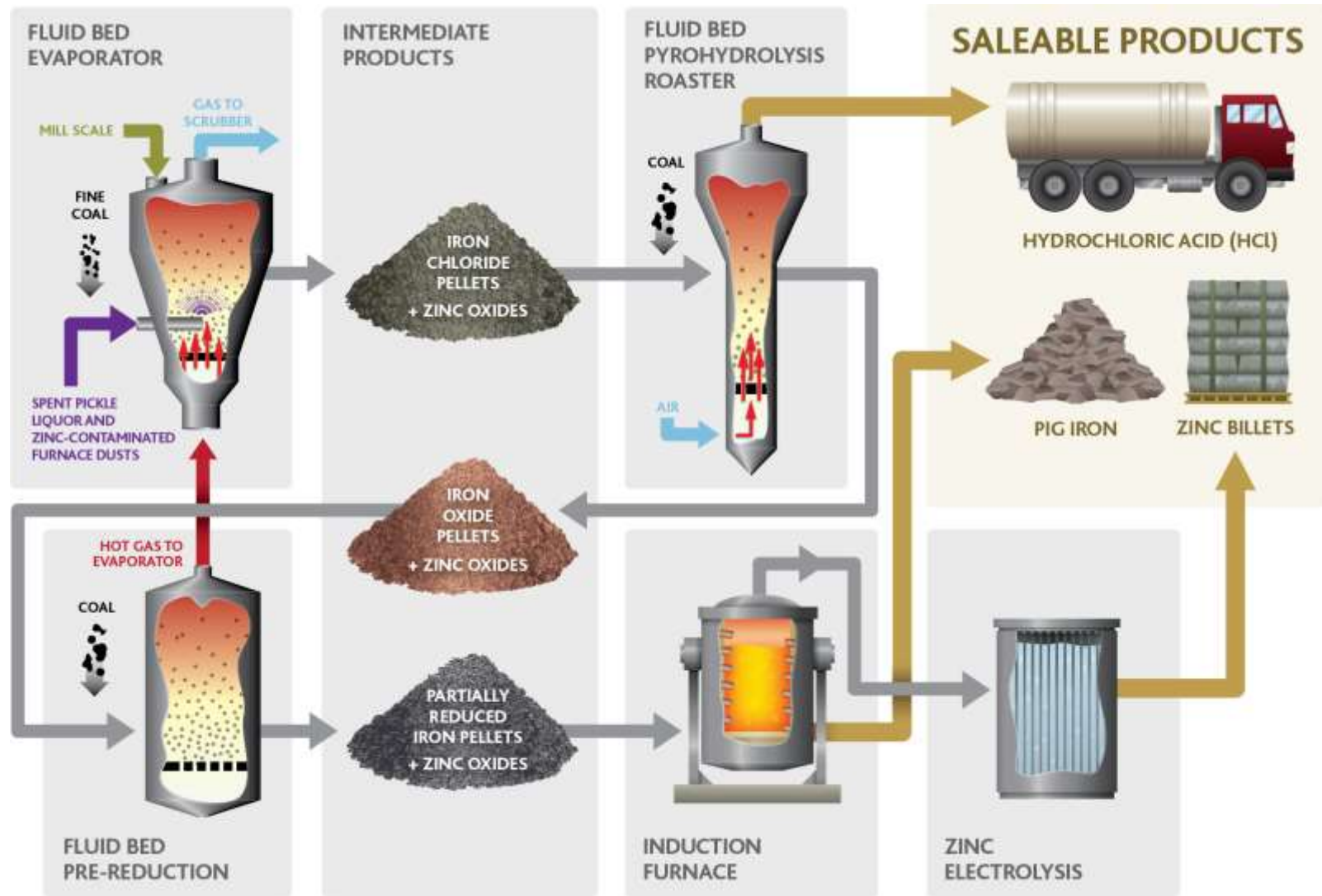


NZIRP – Stage 1 Overview

- **Engineering & Design** **\$1.5 million**
- **Capex** (Estimate – E&D study to confirm) **\$6.0** **"**
- **Commissioning** **\$1.5** **"**

- **Total Plant** **\$9.0** **"**
- **Using Steel Mill & EAF dusts from NSW and SPL, the redesigned plant will have the capacity to produce:**
 - **Pig Iron** **19,400 tonnes/year**
 - **Zinc Oxide** **4,900** **"**
 - **HCl (30%w/w)** **14,200** **"**

NZIRP Stage 2 - Process Flow Diagram



NZIRP – Stage 2 Overview

- Engineering & Design \$ 0.5 million
- Capex & Commission (2016) \$14.0 "
- Commissioning \$ 0.5 "
- Total Zn electrolysis section \$15.0 "
- Production capacity:
 - Pig Iron 19,400 tonnes/year
 - Zinc metal 3,900 "
 - HCl (30%w/w) 14,200 "
- Commences after Stage 1 is generating cash flow

Newcastle Zinc & Iron Recovery Plant

- **Staged approach to minimise Capex and risk**
- **Utilise majority of the existing structure & equipment**
- **Plant modification significantly increases capacity**
- **Complete detailed engineering before starting construction**

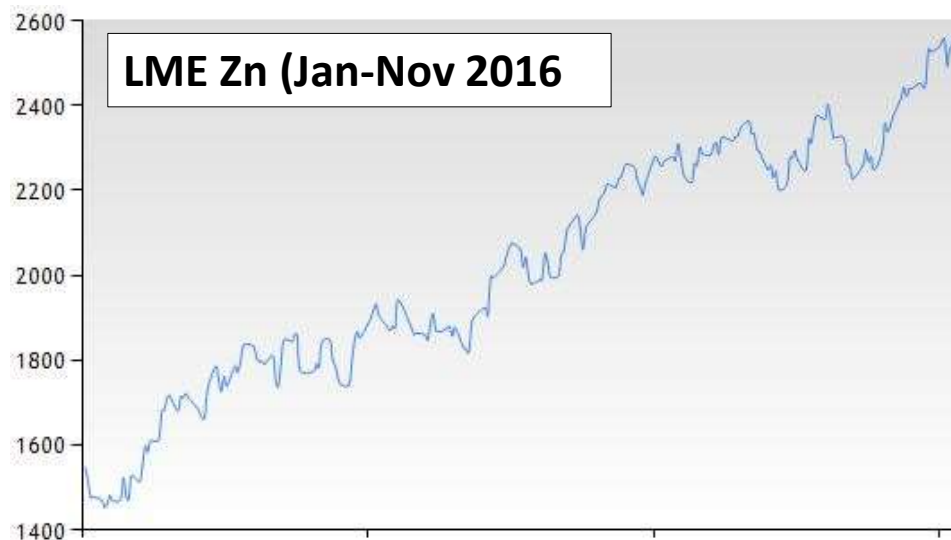
NZIRP – Commodity Price Overview

➤ Pig Iron (upward)

A\$ 575/t

➤ Zinc (upward)

A\$ 3,500/t



➤ HCl (tight market)

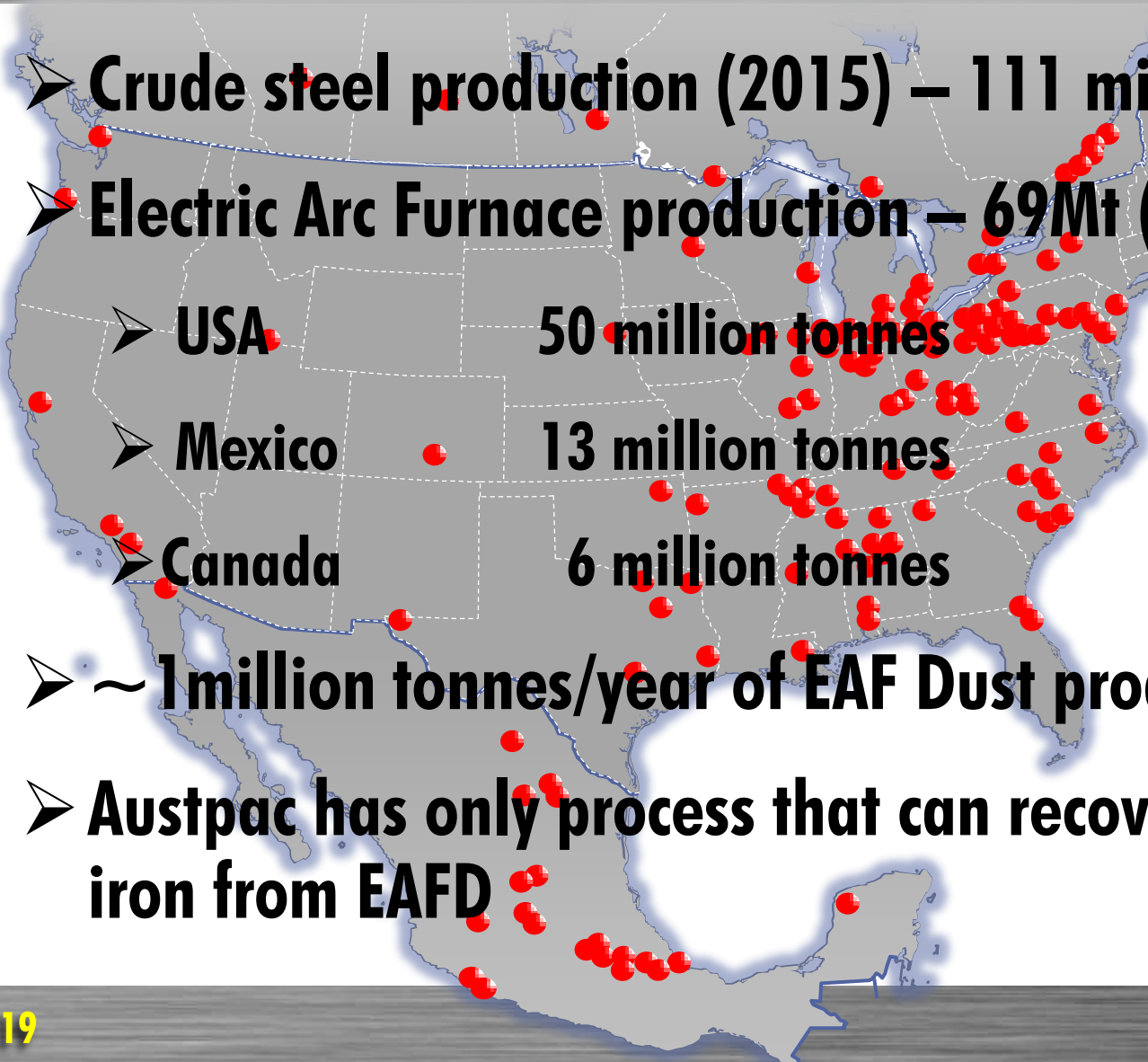
A\$ 250/t

➤ Potential NZIRP Stage 1 Revenue > A\$ 20M/yr

Newcastle Zinc & Iron Recovery Plant

- **Renewed interest from steel producers regarding the staged plant – dusts & SPL supply and ongoing support**
- **Continued investor interest and support**
- **Corporate finance negotiation continued**
- **Plant redesign created opportunity for further R&D tax concession refund – claim being processed**
- **Government support - NSW (EPA resource recovery grants) and Federal (Cooperative Research Centre grants)**

Steel Plants in North America

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- Crude steel production (2015) – 111 million tonnes
 - Electric Arc Furnace production – 69Mt (63%)
 - USA 50 million tonnes
 - Mexico 13 million tonnes
 - Canada 6 million tonnes
 - ~1million tonnes/year of EAF Dust produced
 - Austpac has only process that can recover zinc and iron from EAFD

Opportunity in North America

- **Contacted in early 2016 by a group who recognised the potential for recycling steel mill waste in the USA for Austpac's technology; confidentiality agreement signed**
- **In Q2/Q3 2016 jointly developed models for Zn-Fe-HCl plants in the north-eastern USA; attractive economics**
- **Slow progress made with steel companies during the year - more concerned about economic and political uncertainties**
- **Strong interest in steel companies since November election - potential for rejuvenation of the industry with fresh capital**
- **Positive economic outlook for USA steel from 2017 onwards**

ERMS Synrutile Licence

- **Austpac was approached by a company with a significant ilmenite, zircon & rutile resource in Asia**
- **The company plans to use ERMS SR process to produce high grade synrutile from ilmenite**
- **The licence agreement to use Austpac's technology includes a scoping study followed a bankable feasibility study**
- **The company is finalising negotiations for project funding**
- **Project details to be released once agreement is signed**

Austpac – 2017 onwards

- **Prove Austpac's technologies at the NZIRP**
- **Patent application for process lodged Nov 2016**
- **Staged plant development – ZnO then Zn metal; significantly reduces initial capital requirement**
- **USA potential – steel industry revival and funding**
- **ERMS SR licence concluded and project commences**

The background of the lower half of the image is a photograph of an industrial facility, likely a steel mill. It shows a complex network of pipes, structural steel, and machinery. In the center, there is a bright, glowing orange and yellow molten metal being poured or processed, creating a large splash of sparks and light. The overall scene is dark, with the primary light source being the intense heat of the metal.

RECOVERING ZINC & IRON

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