

# 废钢连续预热技术开发及应用

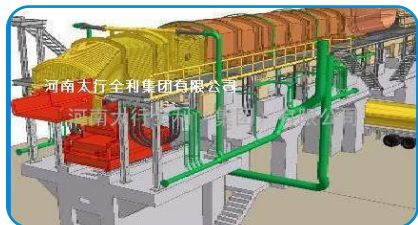
SCRAP STEEL CONTINUOUS PREHEATING TECHNOLOGY: DEVELOPMENT AND APPLICATION

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# 1、转炉炼钢增加废钢比需求

## DEMAND FOR INCREASING SCRAP STEEL RATIO IN CONVERTER STEELMAKING



More scrap steel

废钢量多

价格下降

Price decrease



铁水限产

Hot metal production restriction

Scrap steel ratio increases

废钢比  
增加

# 一、转炉炼钢增加废钢比需求

## DEMAND FOR INCREASING SCRAP STEEL RATIO IN CONVERTER STEELMAKING

### 提高废钢比措施 Measures to Increase Scrap Steel Ratio

方法 Method	优势 Advantages	缺点 Disadvantages
1. Improve scrap steel quality, low-slag smelting 1、提高废钢质量，少渣冶炼	No additional equipment 不增加设备	1. Limited scrap steel resources. 1、废钢资源有限。 2. High scrap steel management requirements. 2、废钢管理要求高。
2. Add supplementary heat agents 2、增加补热剂	No additional equipment 不增加设备	1. Supplementary heat agents often contain S and P elements. 1、补热剂多含 S、P 元素。 2. Increases smelting steps, prolongs smelting cycle, high cost. 2、增加冶炼步骤，延长冶炼周期，成本高。
3. Low-temperature tapping + external refining heat compensation 3、低温出钢、炉外精炼补热	Short smelting cycle 冶炼周期短	high cost. 成本高
4. Scrap steel preheating 4、废钢预热	Significant effect, high automation 效果显著，自动化程度高	Requires site and additional equipment 需要场地，增加设备

## 二、废钢连续预热技术 SCRAP STEEL CONTINUOUS PREHEATING TECHNOLOGY

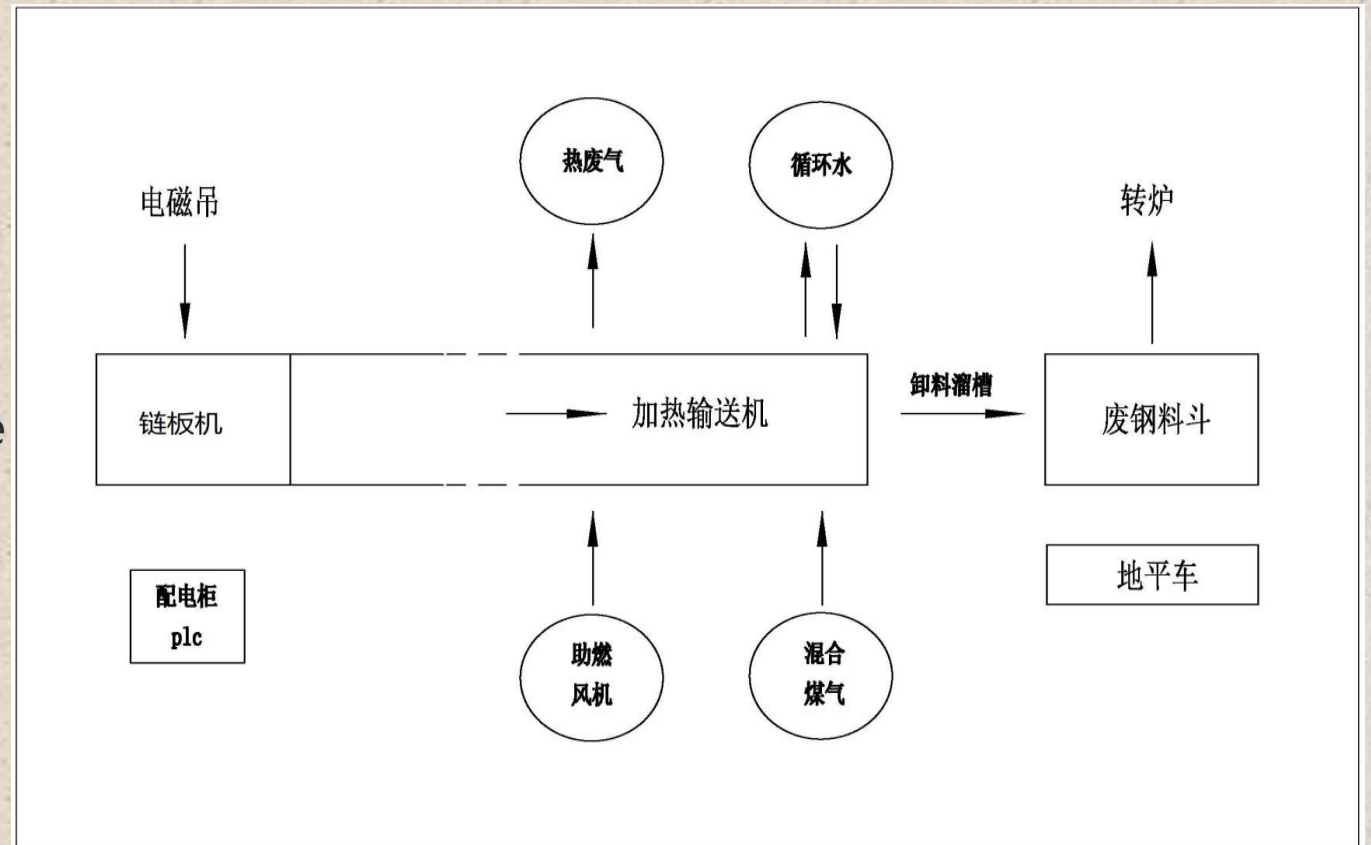
废钢连续预热技术，在输送过程中，通过燃烧转炉煤气对废钢加热，通过控制煤气加入量和传动速度，有效控制废钢加热能力，使之与转炉生产相匹配，在国内属首创。  
Scrap steel continuous preheating technology heats scrap steel by burning converter gas during transportation. By controlling gas addition and transmission speed, it effectively controls scrap steel heating capacity to match converter production. This is a domestic first.



## 二、废钢连续预热技术 SCRAP STEEL CONTINUOUS PREHEATING TECHNOLOGY

### 工艺流程 Process Flow:

- 废钢天车吊装至链板机 Scrap steel hoisted by overhead crane to apron conveyor
- 振动输送机 Vibrating conveyor
- 预热区 Preheating zone
  - 副烧嘴预热区 Auxiliary burner preheating zone
  - 主烧嘴预热区 Main burner preheating zone
- 废钢斗 Scrap steel hopper
- 电瓶车运输至加料跨 Electric vehicle transports to charging bay
- 入炉 Charging into furnace



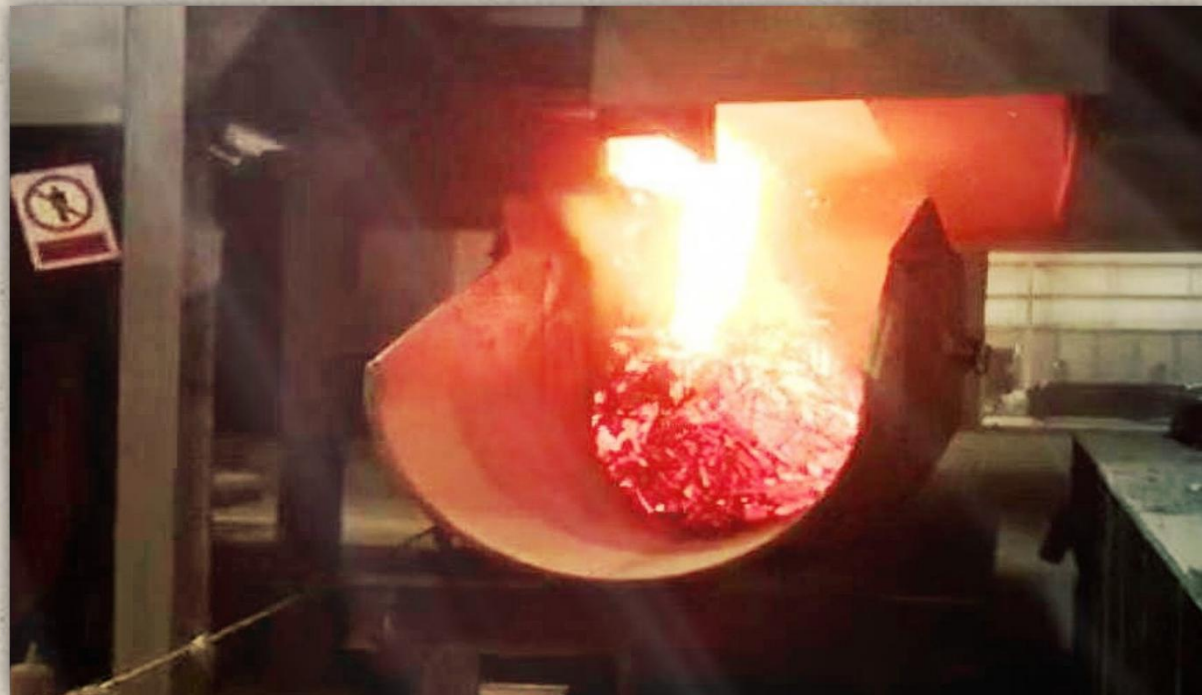


## 二、废钢连续预热技术

# SCRAP STEEL CONTINUOUS PREHEATING TECHNOLOGY

运用效果：该系统废钢预热温度可达到700℃，为减少废钢氧化，河钢唐钢将废钢预热温度控制在400~700℃。

The system's scrap steel preheating temperature can reach 700°C. To reduce scrap steel oxidation, HBIS Tangsteel controls the preheating temperature at 400~700°C.



## 二、废钢连续预热技术

# SCRAP STEEL CONTINUOUS PREHEATING TECHNOLOGY

### 指标 Technical Indicators:

- 唐钢废钢连续预热系统连续三个月的数据统计，废钢预热技术指标见表1所示，废钢预热最高温度810°C，平均温度758°C，废钢平均预热时间为22min。
- Three consecutive months of statistical data from Tangsteel' s scrap steel continuous preheating system are shown in Table 1. The maximum preheating temperature is 810°C, average temperature 758°C, and average preheating time 22 min.

	预热温度/°C Preheating temperature /°C	平台温度/°C Platform temperature /°C	废钢重量 (吨/斗) Scrap steel weight (ton/hopper)	预热时间/min Preheating time /min
最高 Maximum	810	720	25	25
最低 Minimum	711	640	20	20
平均 Average	758	681	22.7	22

# 二、废钢连续预热技术

## SCRAP STEEL CONTINUOUS PREHEATING TECHNOLOGY

表2 预热废钢与常规废钢转炉冶炼情况对比  
Comparison of Converter Smelting with Preheated Scrap vs. Conventional Scrap

模式 Mode	铁水Si/% Hot metal	铁水T/°C Hot metal	终点C/% End-point	终点T/°C End-point	铁水/t Hot metal	废钢/t Scrap steel	钢水/t Steel	铁耗kg/t Hot metal consumption
预热废钢 Preheated scrap	43	1323	0.065	1668	53.15	25.15	75.73	701.84
常规废钢 Conventional scrap	43	1321	0.055	1664	58.77	20.98	75.29	780.58
对比 Difference	0	+2	0.01	4	-5.62	4.17	0.44	-78.74

## 二、废钢连续预热技术

# SCRAP STEEL CONTINUOUS PREHEATING TECHNOLOGY

废钢预热成本见表4所示，水耗18.2m<sup>3</sup>/h，成本5.5元/t；电耗3.1度/t，成本1.6元/t；煤气消耗60Nm<sup>3</sup>/t，成本15元/t，吨废钢的预热成本为22.1元/吨废钢。

Scrap Steel Preheating Cost, Water consumption: 18.2 m<sup>3</sup>/h, cost 5.5 yuan/t, Power consumption: 3.1 kWh/t, cost 1.6 yuan/t, Gas consumption: 60 Nm<sup>3</sup>/t, cost 15 yuan/t, Total preheating cost: 22.1 yuan/t scrap steel

项目 Item	单耗 Unit consumption	能源单价 (元) Energy price (yuan)	成本 (元/t) Cost (yuan/t)
水耗 Water consumption	18.2 m <sup>3</sup> /h	0.3	5.5
电耗 Power consumption	3.1度	0.52	1.6
煤气消耗 Gas consumption	60Nm <sup>3</sup> /t	0.25	15
	合计		22.1

## 三、废钢烘烤经济效益

# ECONOMIC BENEFITS OF SCRAP STEEL BAKING

### 结论 Conclusions:

1、河钢唐钢自主开发的国内首套转炉废钢连续预热系统，利用燃烧转炉煤气对废钢进行预热，可以明显提高转炉废钢比。

2、在低铁耗生产模式下，转炉使用预热废钢可以明显改善终点情况，钢水氧化性明显降低。

3、在正常铁耗生产模式下，使用废钢预热可以明显降低物料消耗，炼钢成本降低2.9元/t。

1、The continuous scrap preheating system for converters uses converter gas combustion to preheat scrap steel, which can significantly increase the scrap ratio of converters.

2、Under low hot metal consumption mode, using preheated scrap in converters significantly improves end-point conditions and reduces steel oxidizability.

3、Under normal hot metal consumption mode, scrap preheating significantly reduces material consumption and lowers steelmaking cost by 2.9 yuan/t.

**Thank You**

