

Hot Briquetted Iron (HBI) Seminar

October 21, 2008

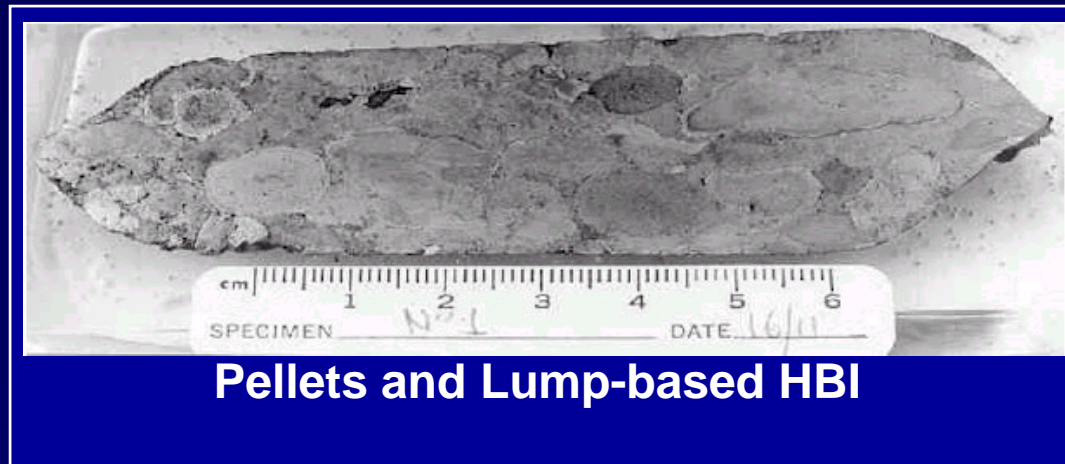
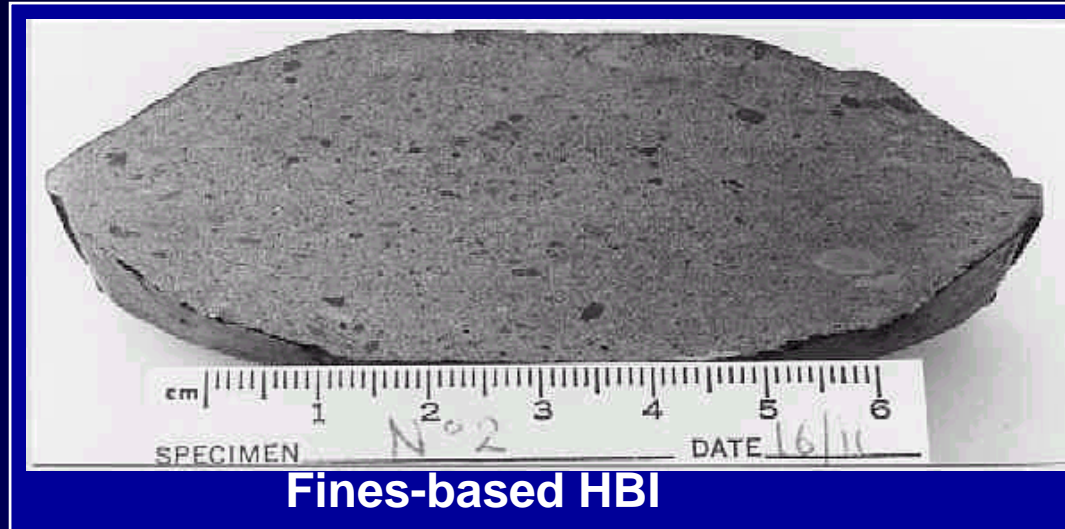
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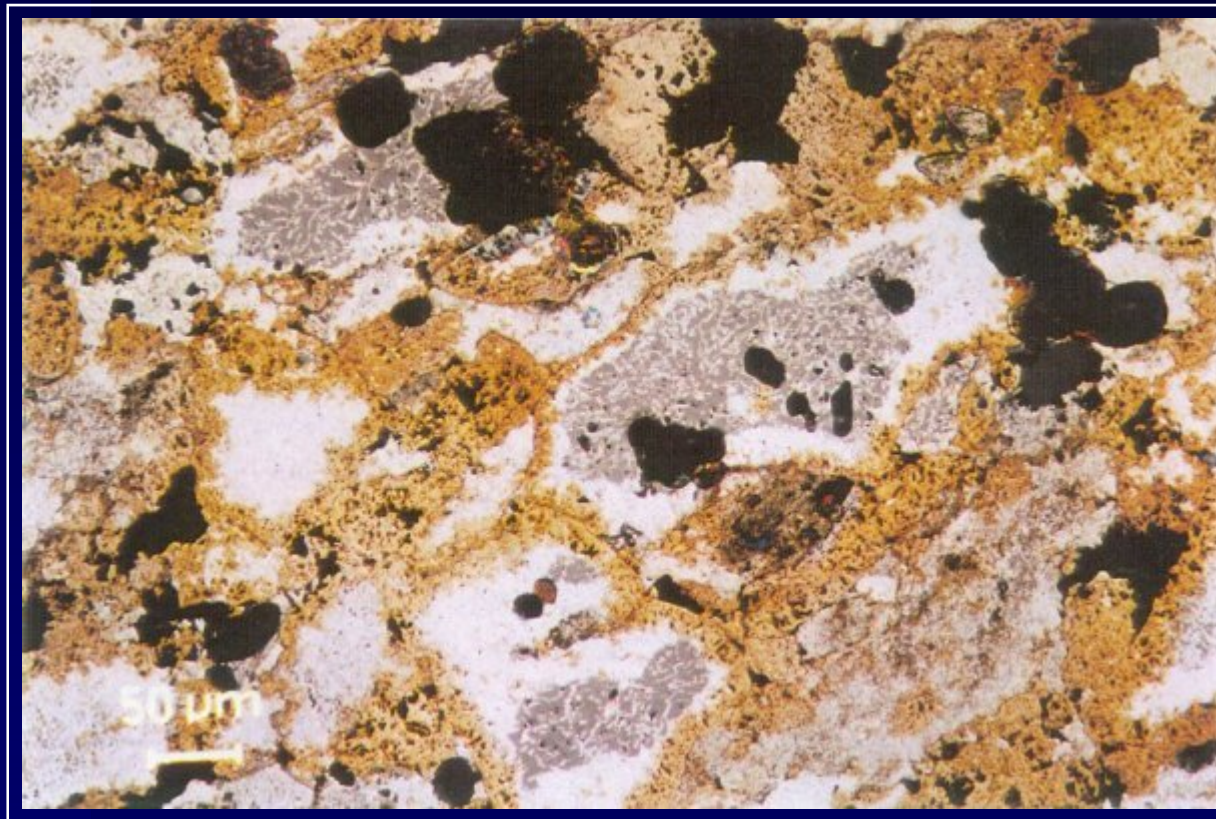
Istanbul, Turkey




Value in Use of HBI for EAF

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Hot Briquetted Iron (HBI) is the hot molded form of **Direct Reduced Iron (DRI)**. The briquetting process is carried out to make the material more resistant to **chemical and physical degradation**, resulting in a more stable product during **handling, storage, and transportation**.





-  Fe⁰
-  FeO
-  Fe₃C

Microstructure of HBI

Photo courtesy of BHP

Benefits of Using HBI

- ✓ It is a very low residual content material
- ✓ It can be handled easier than scrap, DRI, and Pig Iron
- ✓ It is NOT weather sensitive
- ✓ It has twice the density of DRI
- ✓ It can reduce the number of charges dropped
- ✓ It can be continuously fed to the furnace
- ✓ It help you to control nitrogen in steel
- ✓ It establishes consistency in your melt
- ✓ Certified, known chemistry

What Is the Value in Use of HBI Compared to ...?

- ✓ #1 Bundles
- ✓ DRI
- ✓ Pig Iron

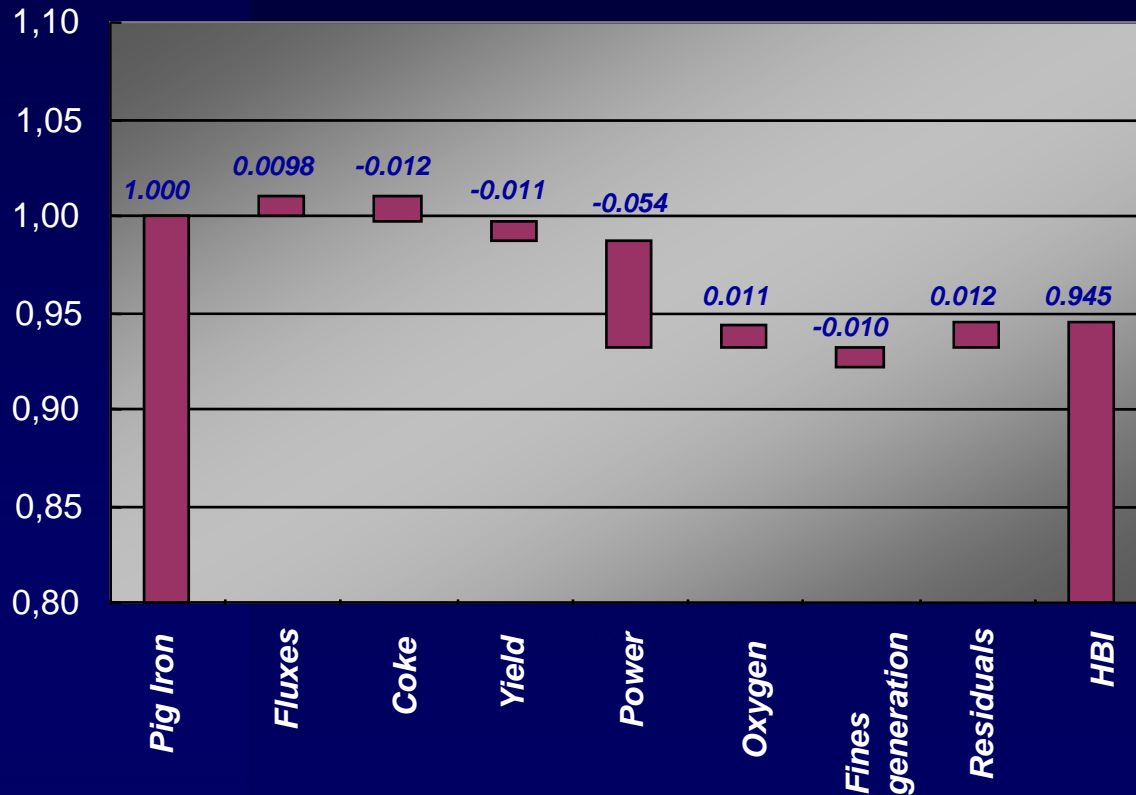
Traditionally, Steelmakers Associate Value in Use of HBI with:

- ✓ Yield
- ✓ Power Consumption
- ✓ Productivity

What Is the Value in Use of HBI Compared to Pig Iron?

HBI is traditionally priced lower than Pig Iron

Value in use of HBI against Pig Iron



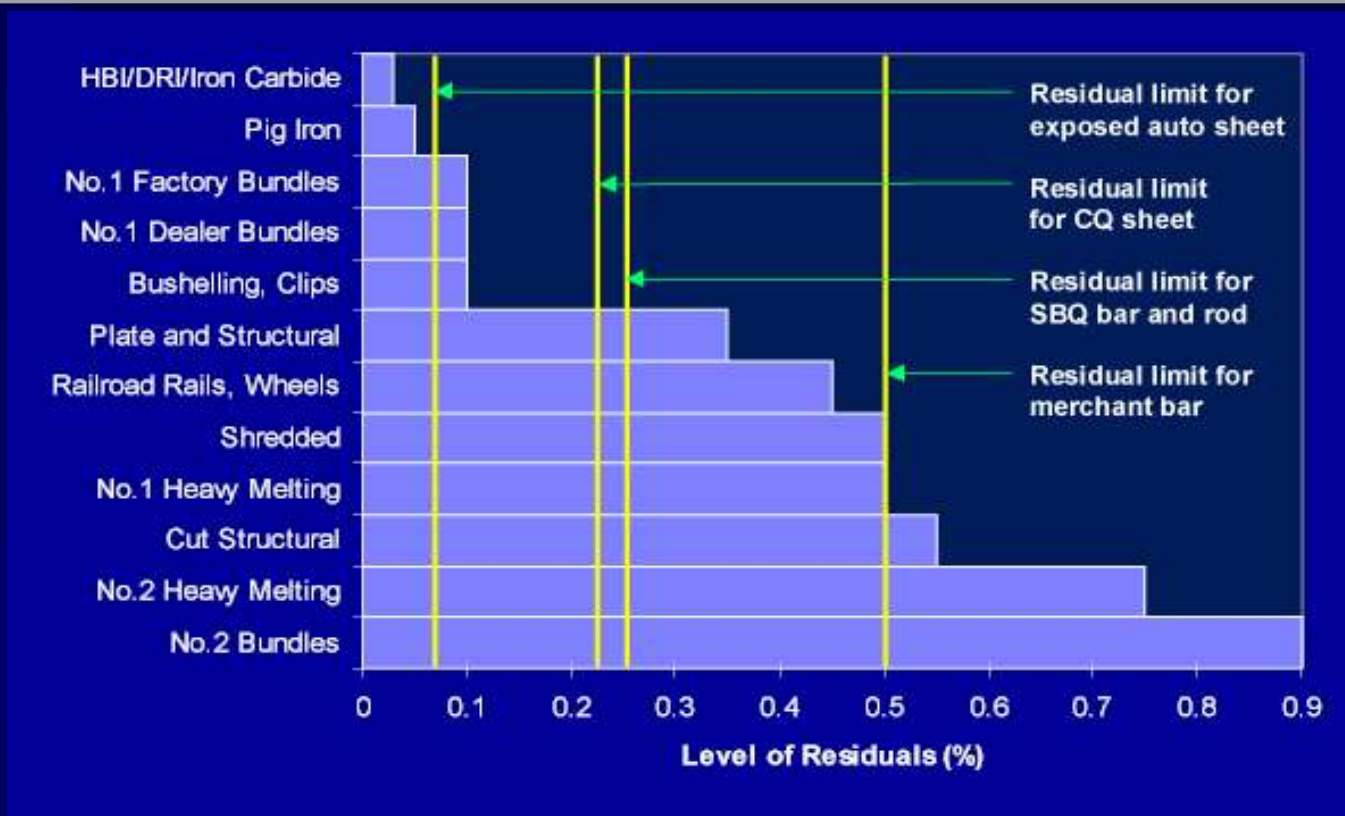
The Value of HBI is **0.945** the value of Pig Iron

Assumptions:

- ✓ Charge limitation is the same for both materials
- ✓ Charging method is the same for every condition
- ✓ Residuals content is the same for both materials
- ✓ Oxygen injection capacity is the same for all consumers
- ✓ All consumers are producing the same quality of steel

How Much Are You Willing to Pay for HBI?

Charging Mix is Determined by Product Quality Requirements



Steel Grade Specifications vs. Metallic Feed Quality

Value in Use Calculations for Different Products

Examples:

✓ Rebar	Cu	0.4% max.
	Total Residuals	1.00% max.
✓ Commercial Q	Cu	0.10% max.
	Total Residuals	0.30% max.
✓ Drawing Q	Cu	0.06% max.
	Total Residuals	0.15% max.

Value in Use Calculations

Furnace Characteristics:

- ✓ Heat Size 100 TIs/heat
- ✓ Average Power 60 MW
- ✓ Oxygen Injection 25 Nm³/TIs
- ✓ Natural Gas 0 Nm³/TIs
- ✓ Continuous Charging Available

Tapping Conditions:

- ✓ Carbon at Tapping 0.06%
- ✓ V-Ratio 2
- ✓ MgO in Slag 10%
- ✓ Tapping Temperature 1640° C

Value in Use Calculations

Method of calculation:

- ✓ Mass and Energy Balance
- ✓ Optimization Cost
 - Metallic Charge
 - Fluxes
 - Transformation Cost
 - Productivity

Restrictions:

- ✓ Residual Level in Liquid Steel
- ✓ Metallic Charge Limitations

Metallics Specifications

	#1 Bundle	Busheling	#1 HMS	Shredded	#2 HMS	Turnings	Pig Iron	HBI
FeT	98	97.14	94.5	95.5	92	87.5	94	92.5
Fe ⁰	96	95.14	89	92.1	83.72	75.68	94	86
C	0.07	0.07	0.2	0.1	0.25	0.40	4	1.5
Mn	0.3	0.7	0.6	0.5	0.5	0.9	0.5	0.009
Si	0.1	0.2	0.2	0.2	0.3	0.5	0.7	
P	0.015	0.02	0.05	0.03	0.03	0.04	0.014	0.08
Gangue	0.6	0.8	1.5	1	2	1.9	0	3.5
Cu	0.11	0.13	0.16	0.25	0.3	0.3	0.005	0.001
Ni	0.05	0.05	0.15	0.15	0.13	0.15	0.007	0.006
Mo	0.01	0.03	0.03	0.03	0.03	0.04	0.005	0.001
Cr	0.06	0.07	0.09	0.12	0.1	0.3	0.009	0.004
Sn	0.02	0.03	0.02	0.01	0.01	0.025	0.003	0.002

Value in Use Calculations

Metallic Charge Limitations

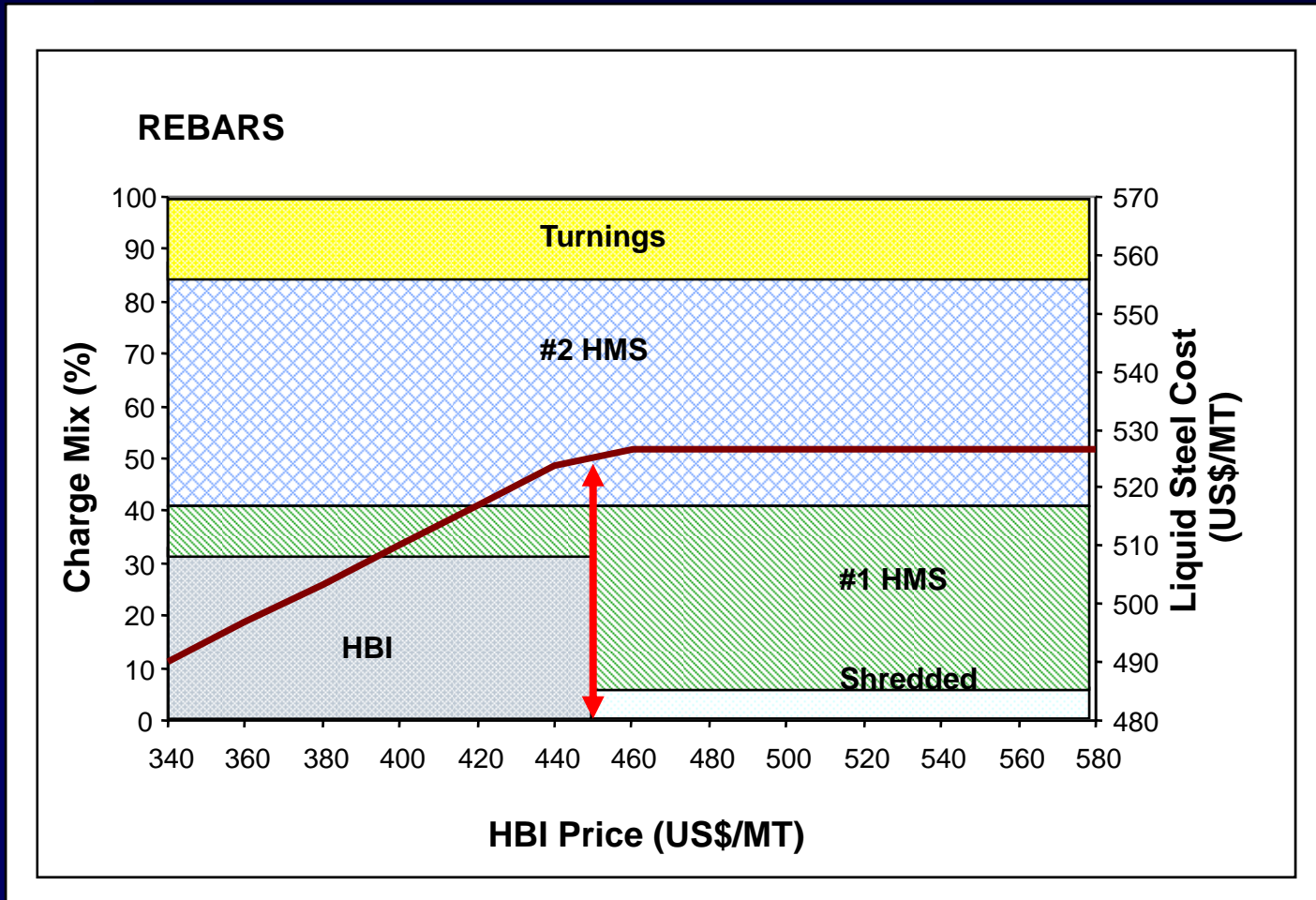
✓ #1 Bundle	25% max.
✓ Bushelings	15% max.
✓ #1 HMS	50% max.
✓ #2 HMS	50% max.
✓ Shredded	30% max.
✓ Turnings	15% max.
✓ Pig Iron	40% max.
✓ HBI	30% max. (bucket) 60% max. (continuous)

Scrap Price

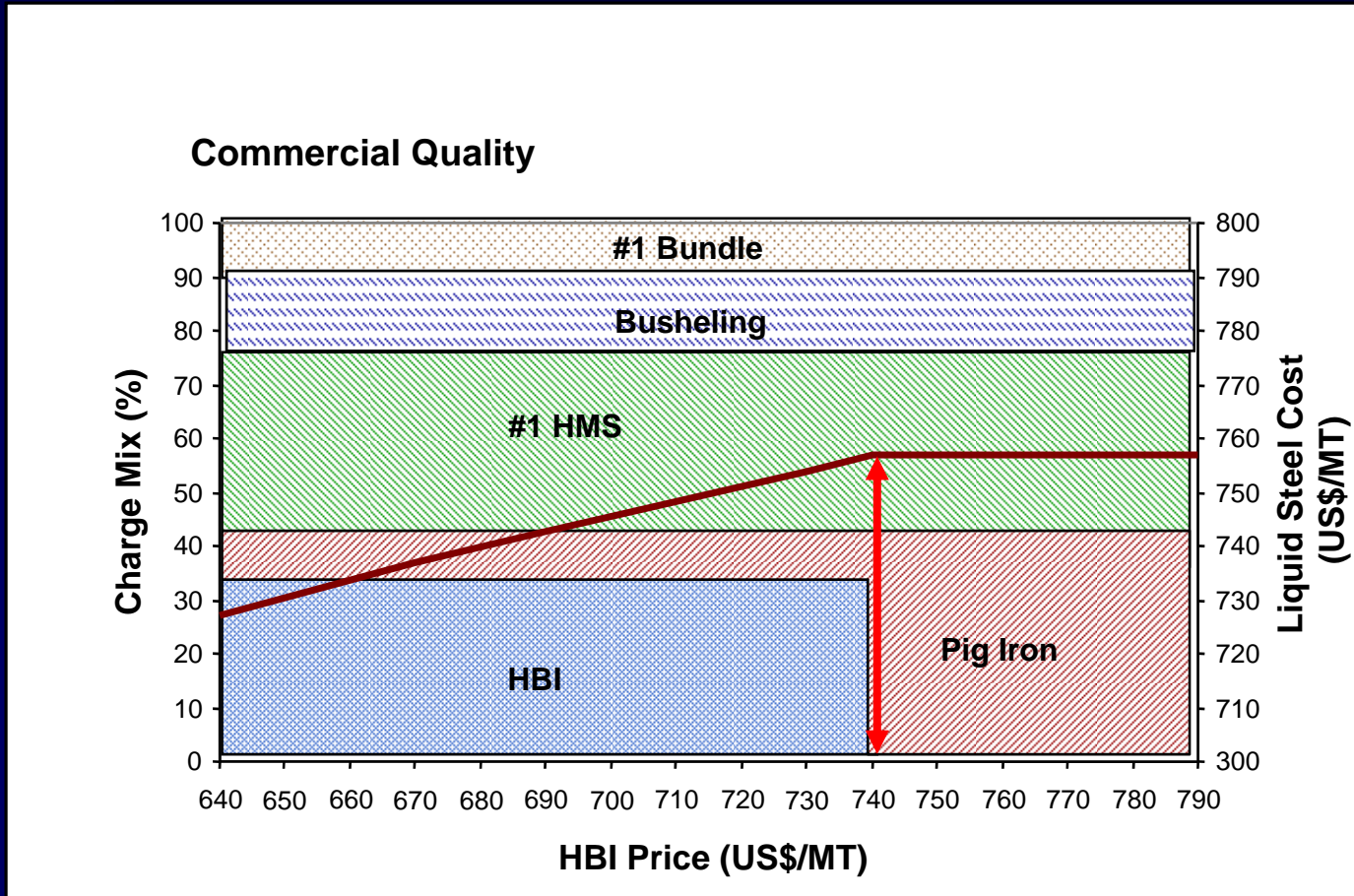
✓ #1 Bundles	845 us\$/mt
✓ Bushelings	844 us\$/mt
✓ #1 HMS	467 us\$/mt
✓ #2 HMS	461 us\$/mt
✓ Shredded	540 us\$/mt
✓ Turnings	343 us\$/mt
✓ Pig Iron	770 us\$/mt

Source: AMM Sept. 2008
 CRU Monitor Sept. 2008

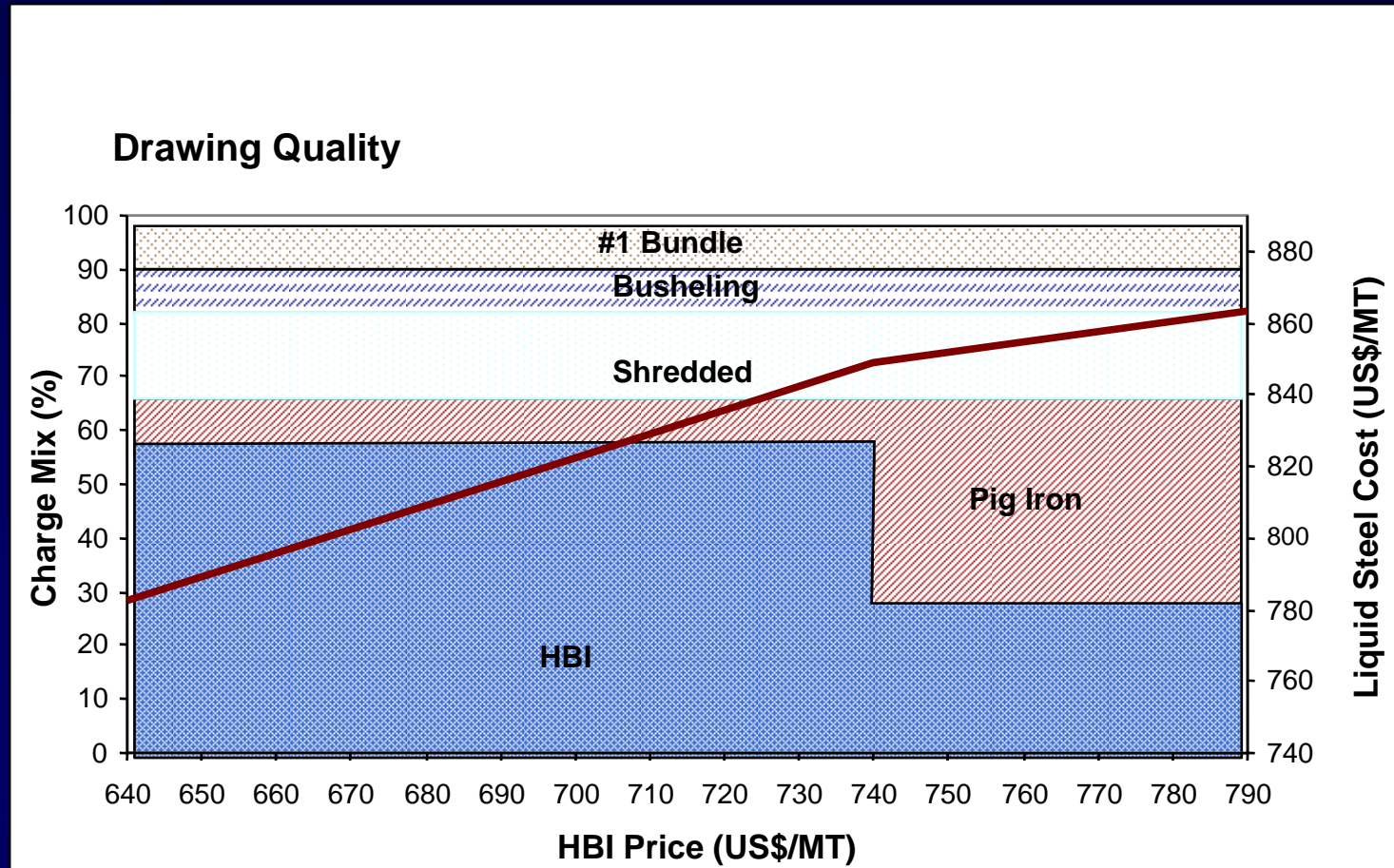
Liquid Steel Cost and Charge Mix vs. HBI Price



Liquid Steel Cost and Charge Mix vs. HBI Price



Liquid Steel Cost and Charge Mix vs. HBI Price



Other Important Applications

- ✓ HBI is used in BF to increase productivity and to reduce coke rate
- ✓ HBI is used in BOF as a coolant
- ✓ HBI can be used in ladle metallurgy as a coolant and in foundry furnaces as a primary charge

All steelmakers have to compete for HBI in the same market

Conclusions

- ✓ HBI value is different for each melt shop and will depend on local conditions for scrap, the equipment used in steel production, the metallurgical practices, and the product mix
- ✓ HBI should not be considered as a scrap substitute but rather as a source of clean iron units that can be used to enhance the scrap charge or to replace higher cost Pig Iron
- ✓ HBI is a high Fe, low residual metallic material for producing high quality iron and steel products in a wide variety of furnaces



Value in Use of HBI for EAF

**Thank you for your
attention**

www.hbia.org