

Steel Bridge Update: Research & Market Conditions



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***AISI CAG & WAG
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Baltimore

AISI Advisory Group Meetings



- *Bridge Task Force – 08/13-14/09 - Baltimore*
- *Welding Adv. Group – 04/02/09- Wash.,D.C.*
- *Steel Adv. Group – 1H/09 - Lehigh Univ.*
- *Design Adv. Group. – 08/12/09 – Baltimore*
- *Corrosion Adv. Group – 04/01/09 - Wash., D.C.*

Welding Activities

- Update of AWS D1.1 and D1.5 (Phillips): in next edition, also to include Fab. Guide info. in annex
- Optimized weldments of HPS 70W and HPS 100W (Lehigh) – **need proposal – FHWA funding**
- Guidelines for HPS 70W consumables (Yost); revise
- HPS 100W Welding Guidelines (Yost)
- HPS 50W guidelines & FCAW/GMAW issues (LeT) – **FHWA funding**, same as 50W
- ESW - NG – High flange splices
- Stud Welding of HPS 100W and A1010 (LeT) - **FHWA funding**

Design Issues



- Live-Load deflection criteria for HPS bridges (WVU, UW)
 - FHWA & AISI funding
- Ductility capacity of HPS 100W tension members (LU) – need proposal for FHWA funding
- Superior toughness of HPS (FHWA, Purdue) – final report
 - Issues with “fracture-critical” and HPS – FHWA funding
 - Non-fracture critical two girder bridge (VaTech, Purdue)
 - Twin Box Issues –
 - UT Austin, Grand Experiment
 - Marquette Interchange - HNTB
- Seismic issues (UNR) - develop code – AISI & FHWA funding
- Fatigue behavior of cross frame connections (UT) – AISI funding



Weathering Steel / Corrosion Activities

- ArcelorMittal long term exposure testing of HPS and other new steels - concerns because of costs; new seaside @ Kennedy Space Center
- NYSDOT Moore Drive Rochester evaluations
 - A1010 & new steel samples added ; measured (ODU, ArcelorMittal)
 - Cook evaluations of number of NYSDOT Roch. Bridges – **AISI Funding**
 - Variables affecting performance (Gallagher) – **FHWA funding**
- Resources available for site evaluations
- Update of FHWA Technical Advisory
- Painting issues (FHWA , KTA)
 - Evaluation of single coat systems ; 12 mils polyaspartic, water borne epoxies

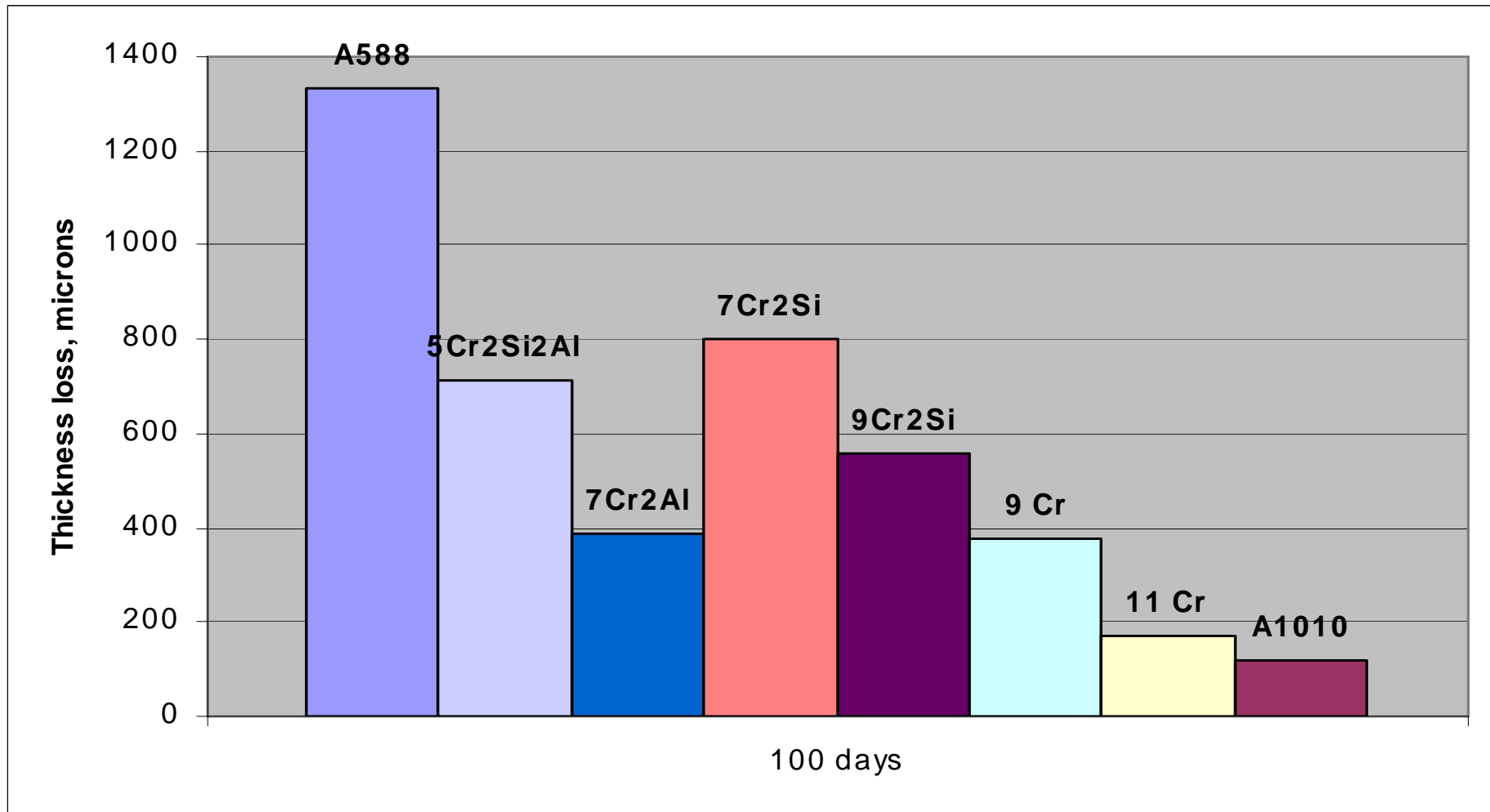
Steel Development



- HPS 100W - latest applications
 - NY, NB, WV and NC in service; Throgs Neck Bridge retrofit
 - 100W to be removed and only HPS 100W used
- A1010 used in one bridge; 12% Chromium grade
 - CA used .160" thick, open to service, tested
 - Oregon DOT considering with Idaho and Wash.
 - Project to use in hybrid laser welding of decks (ATS) –
FHWA funding
- New Corrosion Resistant Steels - **FHWA Funded**
 - Lehigh University – looking at Cu-Ni-Si steels
 - ArcelorMittal – looking at leaner 12% Cr steels
 - Lab scale heats , rolled to plate, – basic properties
 - Accelerated corrosion testing , then long term exposures

Accelerated Corrosion Test Results

ArcelorMittal Research Trials

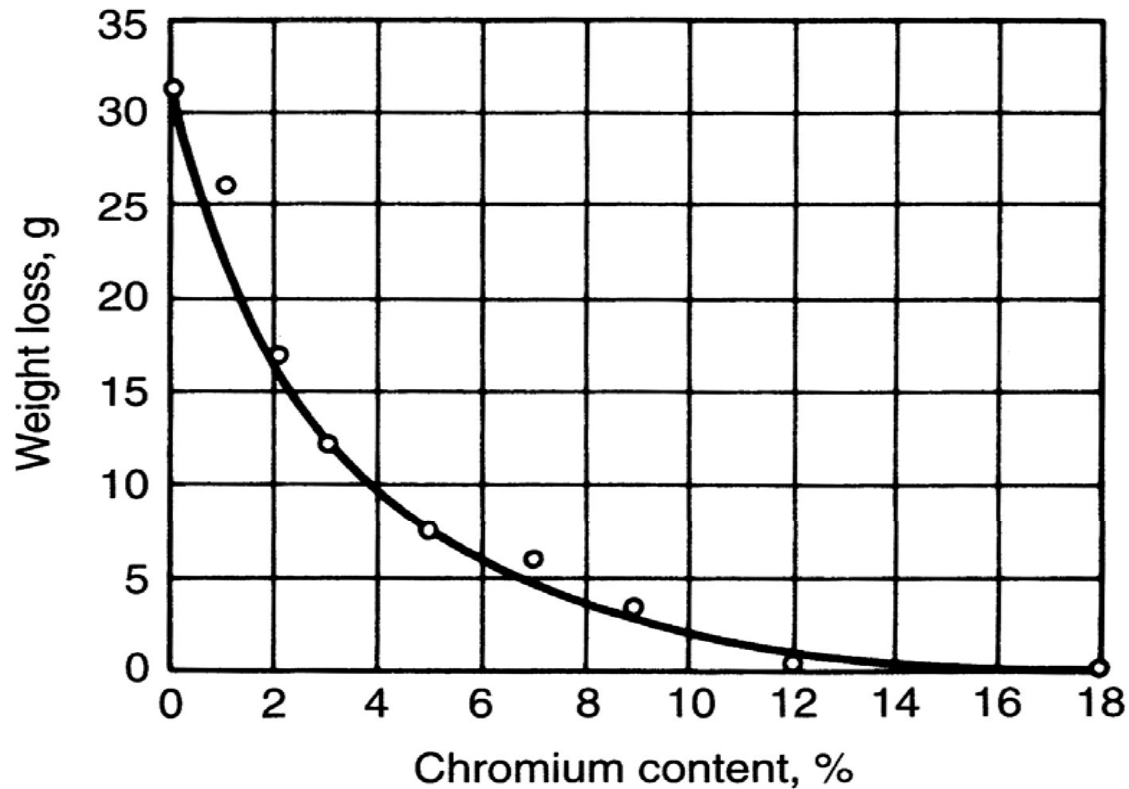


Chromium Counteracts Chloride

The New Steel



Conditions - Source: LaQue, 1951



Traditional Steels and New HPS for Bridge Construction



| A709/M270 Grade | Similar ASTM | Typical Production | Nominal Levels C.E. | C |
|--------------------|--------------|--------------------|---------------------|------------|
| 36 | A36 | HR | .33 | .15 |
| 50 | A572 | HR | .38 | .15 |
| 50W | A588 | HR | .48 | .15 |
| 50S | A992 | HR | .45 | .15 |
| <i>100W delete</i> | <i>A514</i> | <i>Q&T</i> | <i>.59</i> | <i>.16</i> |
| HPS 50W | - | HR, TMCP, T | .50 | .10 |
| HPS 70W | - | TMCP, Q&T | .50 | .10 |
| HPS 100W | - | Q&T | .60 | .06 |
| - | A1010 | T, N&T, Q&T | NA | .01 |

HR - Hot-Rolled, TMCP – Thermal-Mechanical-Controlled-Processed, Q&T - Quenched and Tempered, N - Normalized

$$C.E. = C + \frac{Mn}{6} + \frac{Cu + Ni}{15} + \frac{Cr + Mo + V}{5}$$

Steel Market Trends

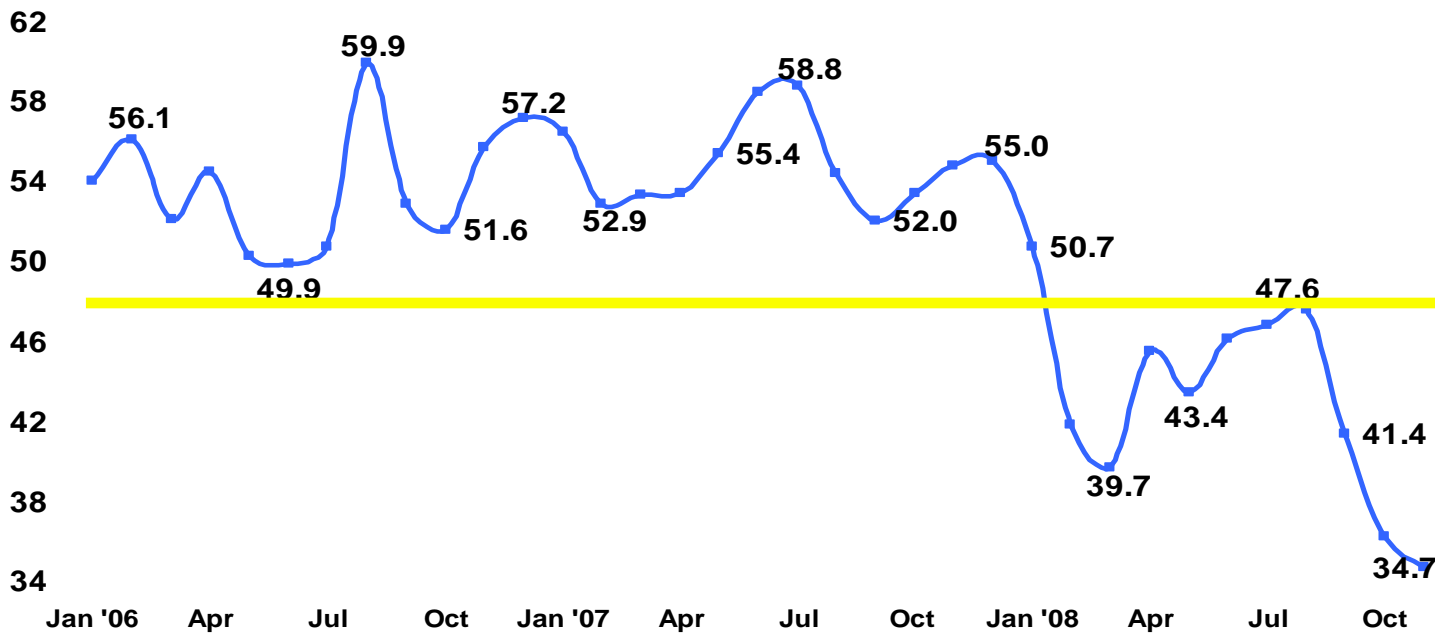


Architecture Firm Billings Have Dramatically Declined in 2008



billings scores since 2006

index: 50 = no change from previous month, Above 50 = increase in billings from previous month



Architectural billings are heavily weighted toward institutional, commercial and industrial buildings although multi-family residential is also included. Architectural billings precede construction spending by 9-12 months.

November 2008 index is lowest on record...

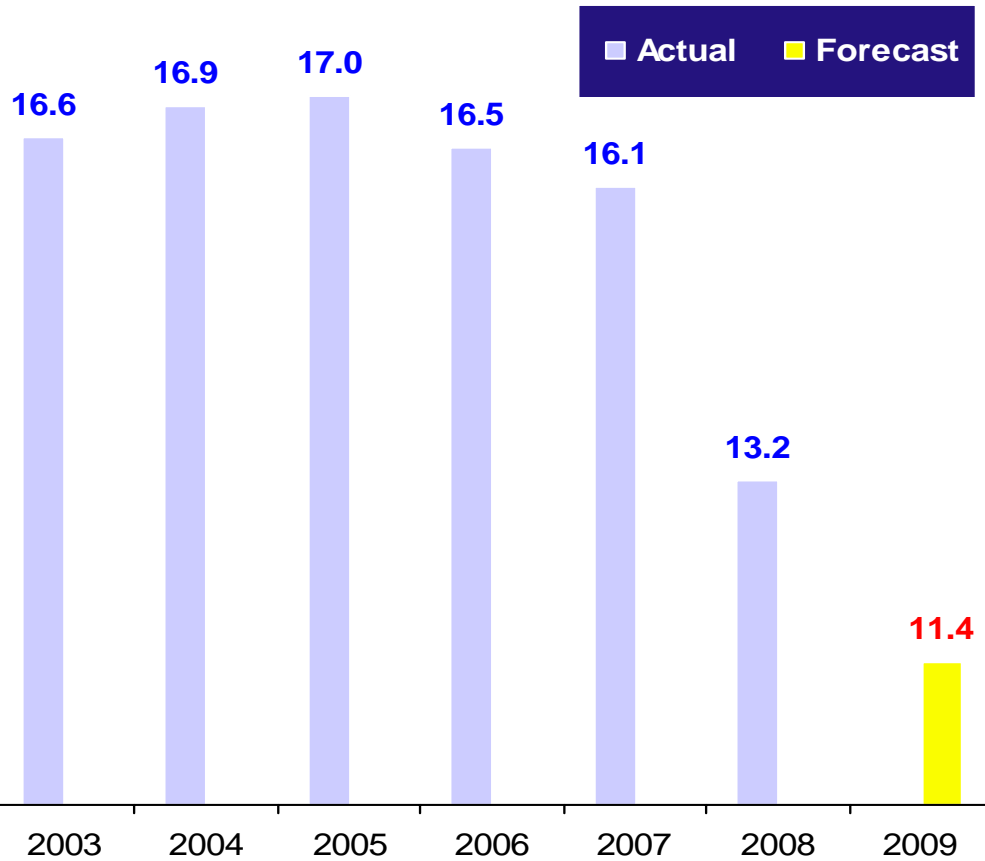
Source: AIA Architecture Billings Index

Automotive



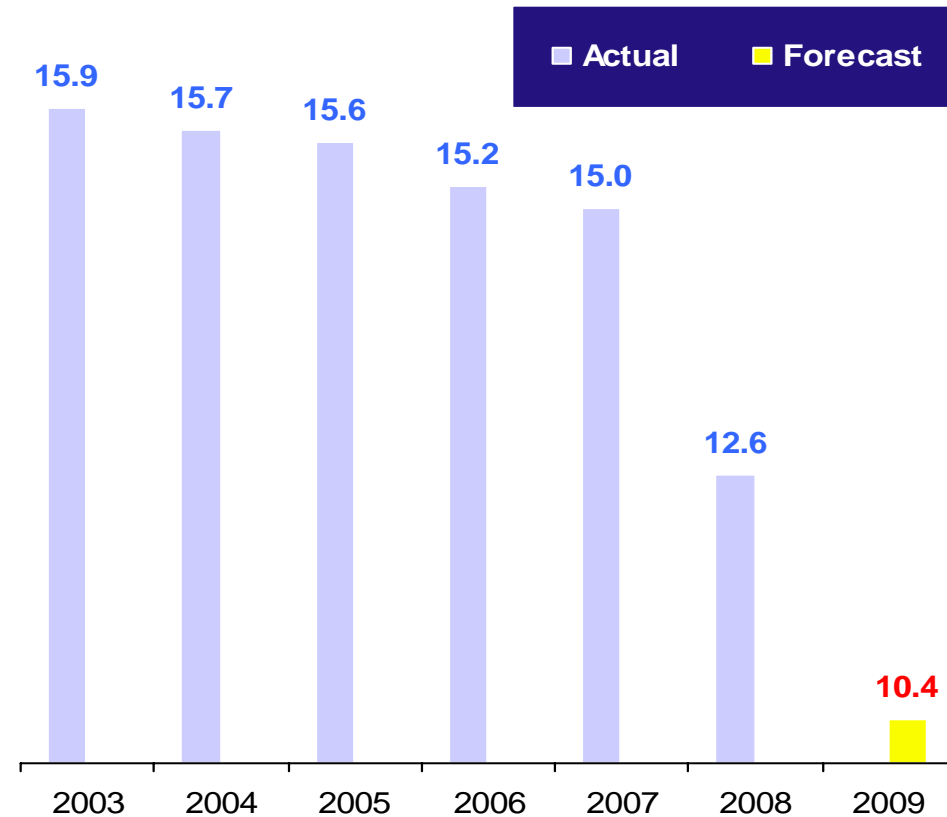
USA Sales

(millions of units)



North America Production

(millions of units)

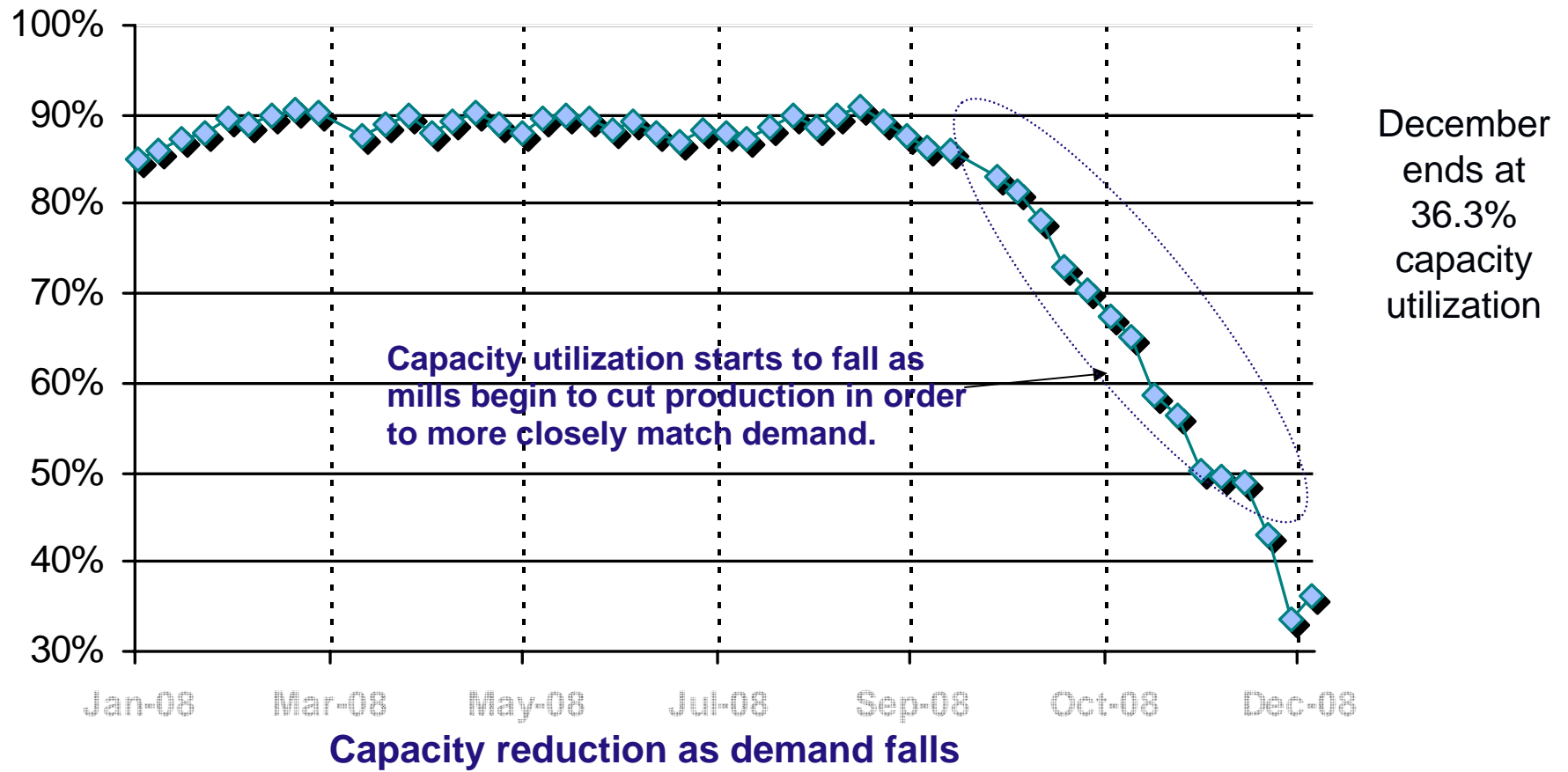


Source: JD Power & Associates

Steel Supply



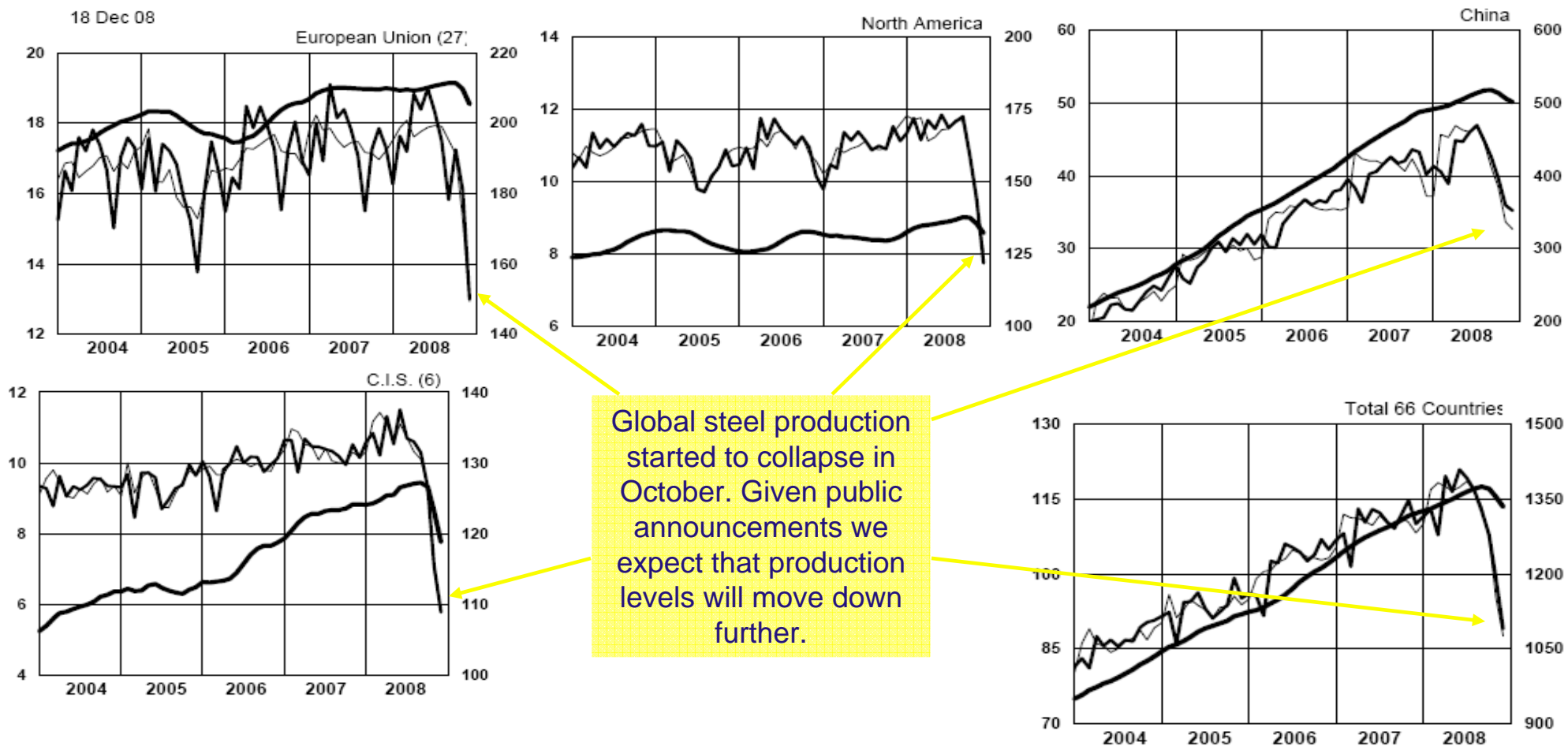
Raw Steel Capacity Utilization





MONTHLY CRUDE STEEL PRODUCTION million metric tons

— actual monthly data — deseasonalised monthly data — 12 months running total

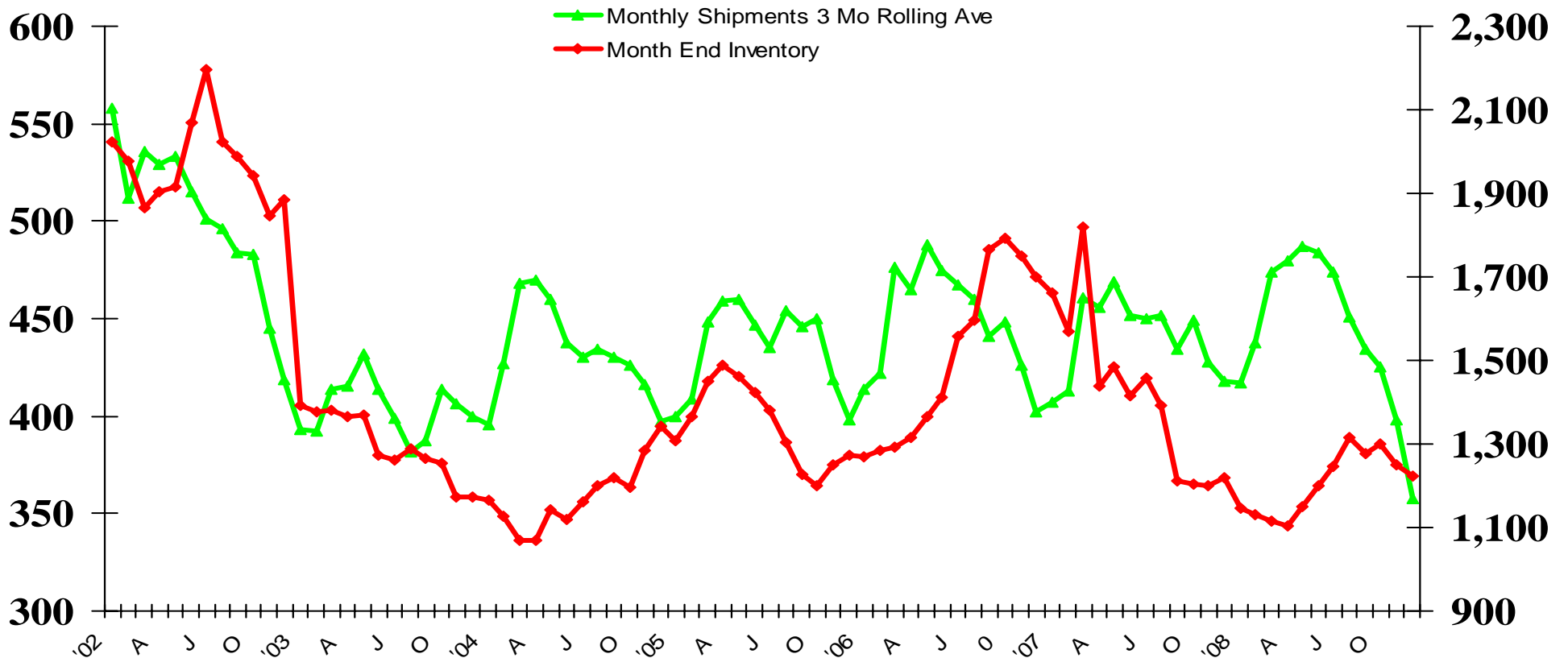


U. S. Steel Service Center Total Shipments & Inventories Carbon Plate

Based on a representative sample of the U.S. Service Center Industry



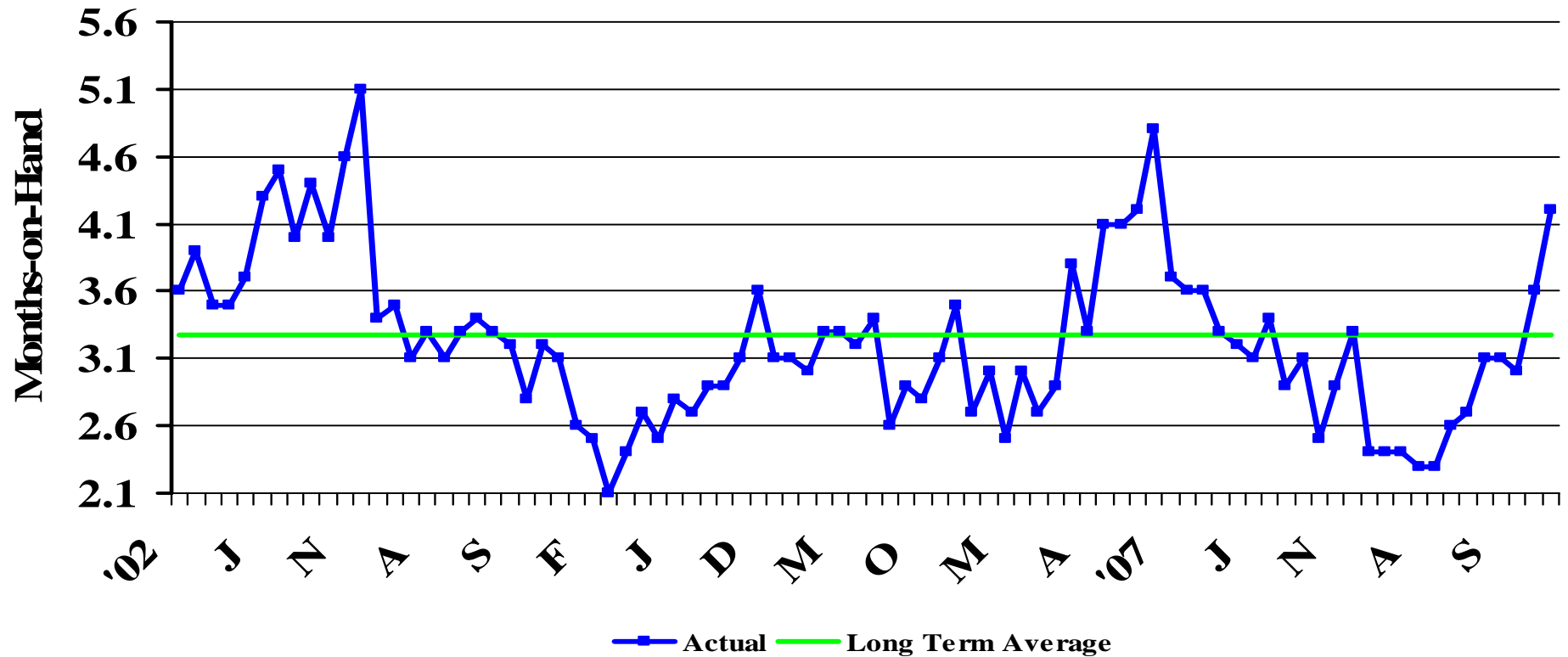
Monthly Shipments ,000 Tons



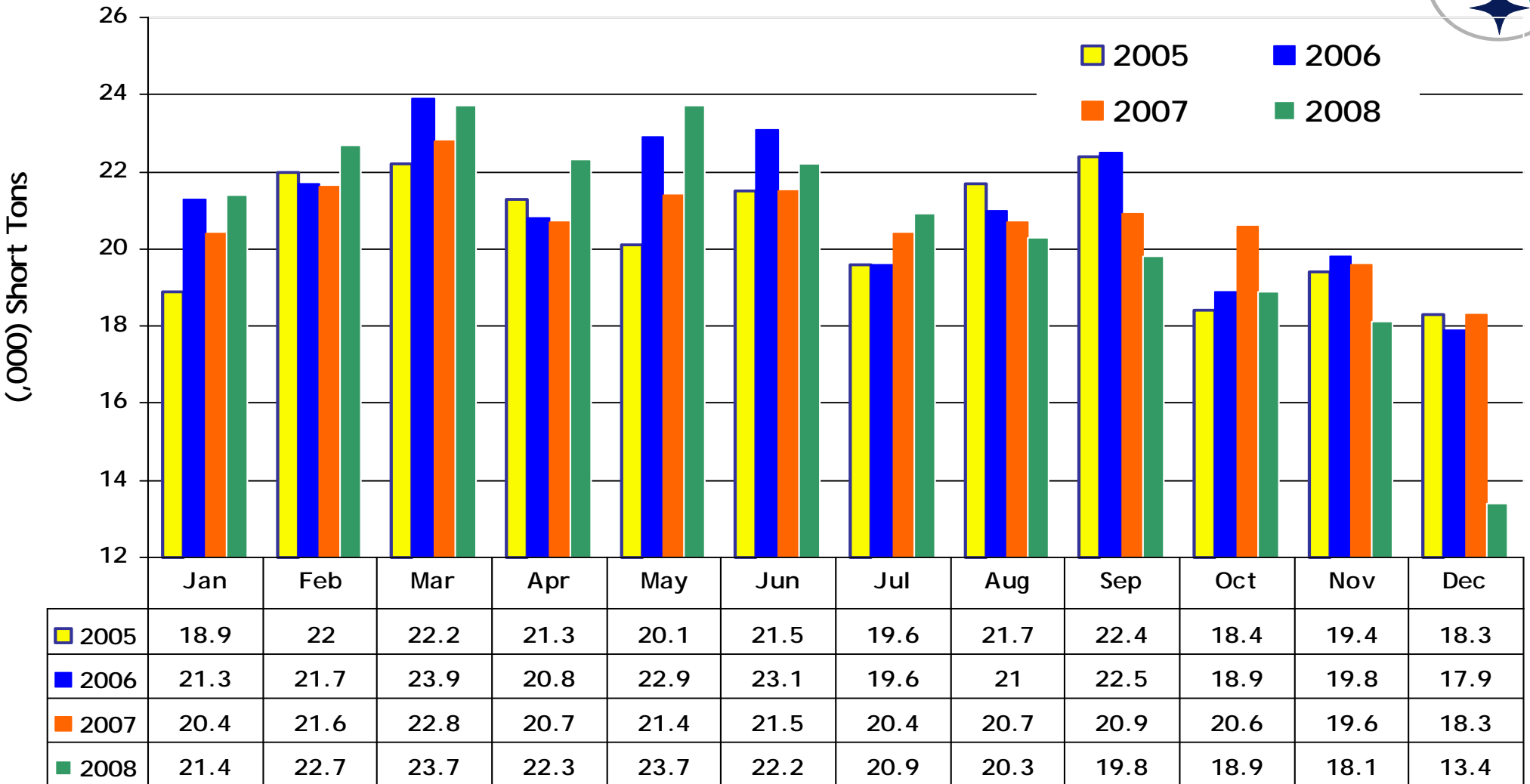
U. S. Steel Service Center Number of Months Shipments on Hand

Based on a representative sample of the U.S. Service Center Industry

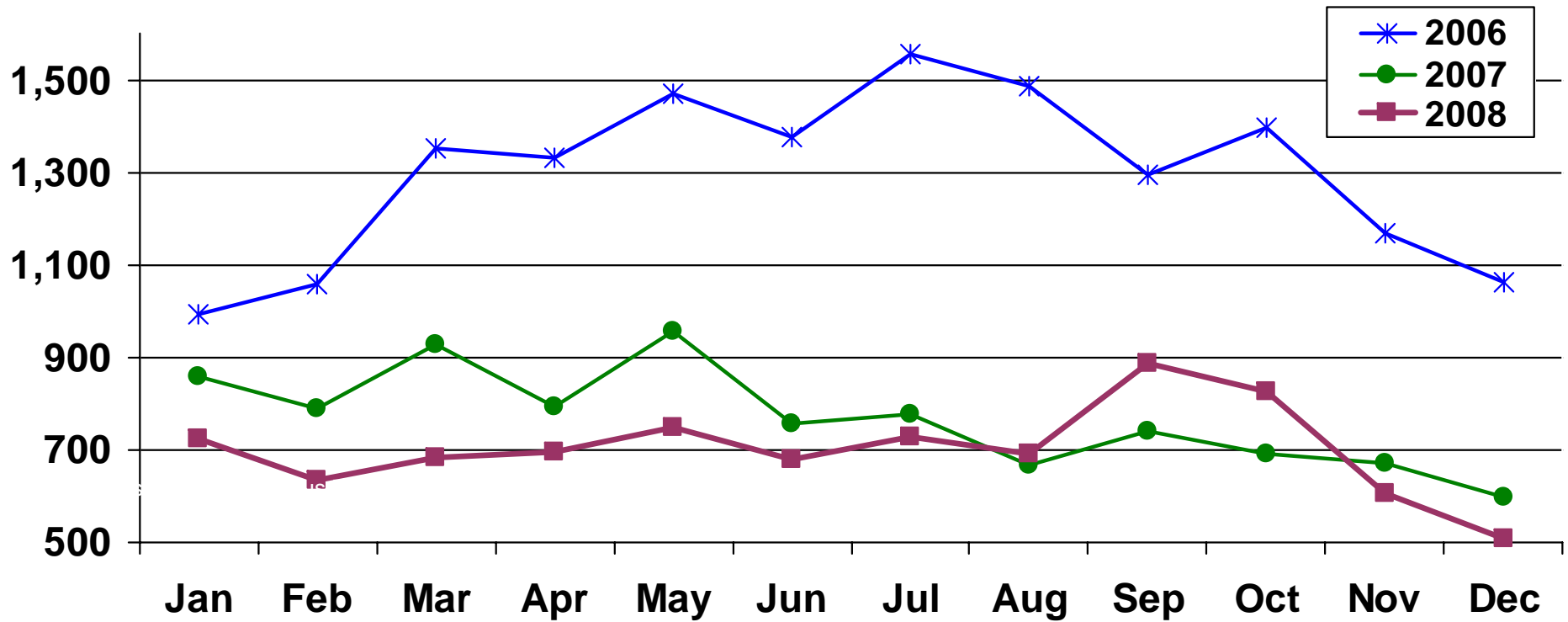
Carbon Plate



Carbon Plate US Service Center Shipments: Average Tons per Day



Imports: Carbon Flat Roll



Imports of flat rolled steel in 2008 was 9% lower than in '07.

2009 Import data is being reviewed critically for evidence of dumping.

2009 Market Outlook Summary



- The financial crisis has weakened our outlook for 2009. Global growth is threatened too.
- Home values continue to erode.
- Real wages are falling. Disposable income declines.
- Unemployment is rising.
- Credit availability is open issue.
- Energy sector weakens somewhat with falling energy prices
- Agricultural and mining sectors weaken in 2009 as a result of falling commodity prices.
- Auto production will be down from the disappointing performance in 4Q 2008.
- Housing bottom is hopefully near and we may see a marginal increase next year. Housing prices will not recover in 2009, however.
- Non-residential construction will contract.

2009 will be a difficult year for U.S. manufacturing.

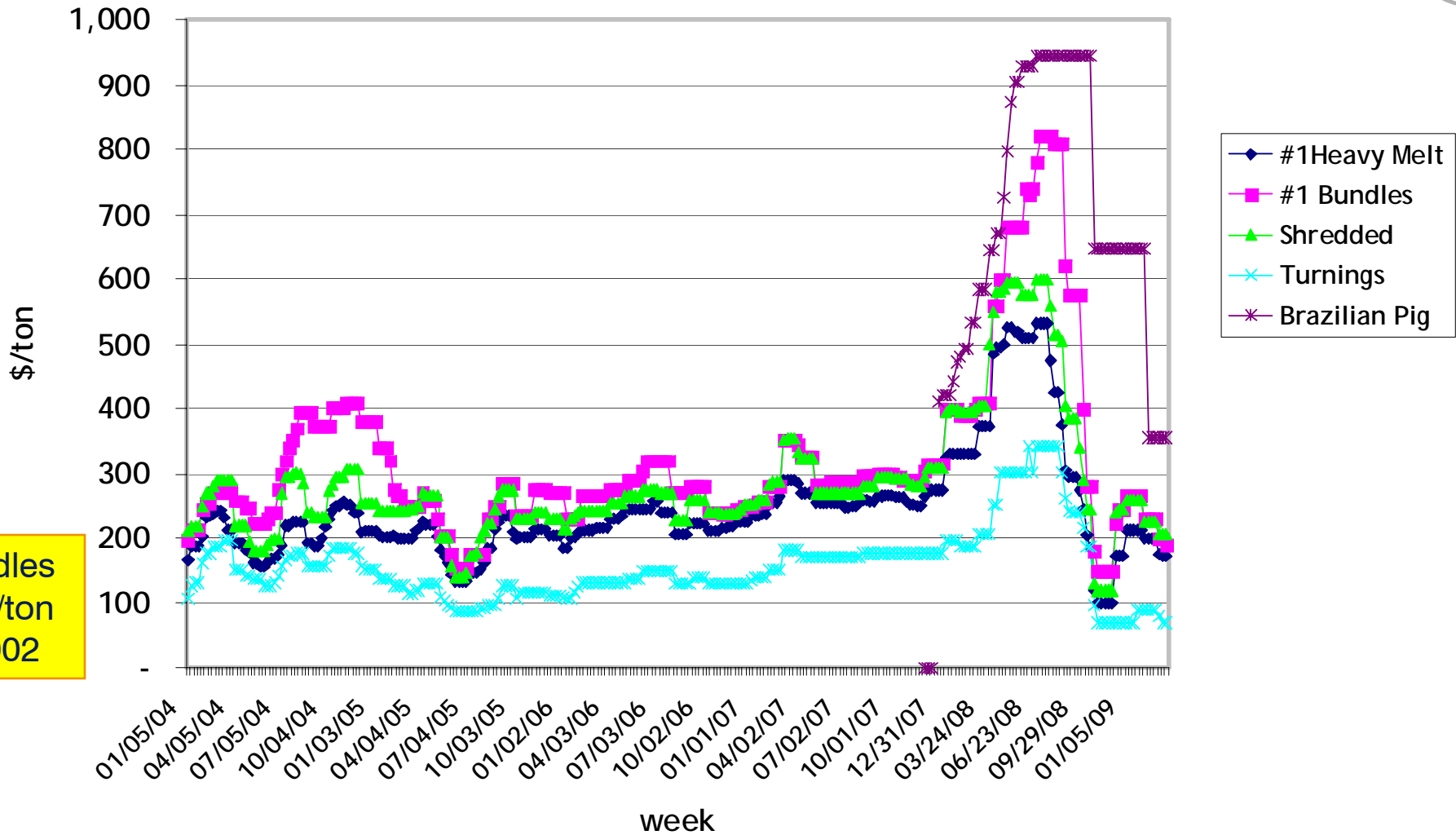
Pricing



Any Good News?

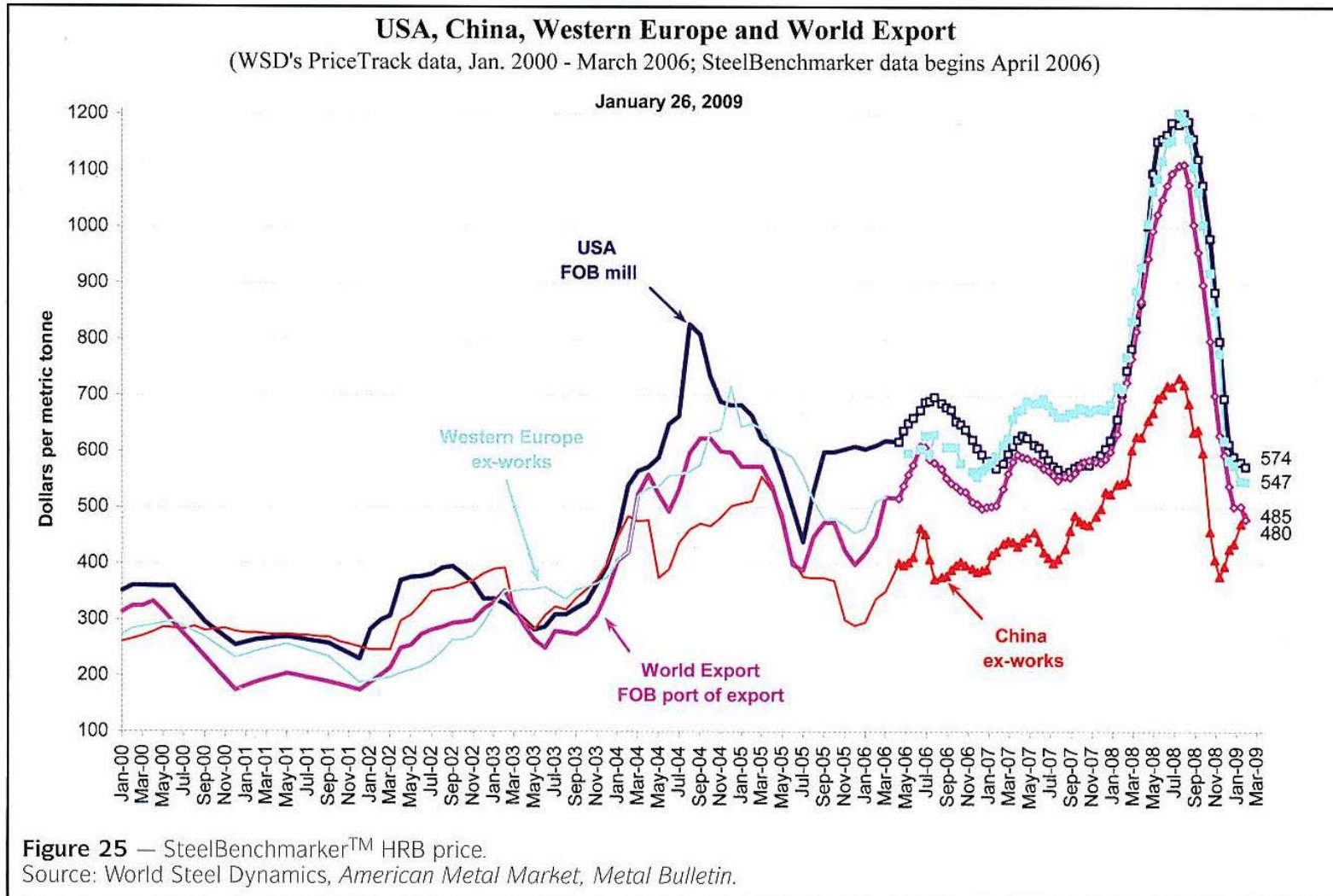
- The remaining steel companies are in better shape to survive than they were in 2000
- Spot prices for coal/coke, iron ore, scrap, energy, freight rates, ferroalloys (Ni, Mo) are dropping
- All global steel economies are feeling pain; imports to USA may increase so China watch is on for dumping
- Steel prices are dropping
- Total U.S.A. inventories of steel 11mT to 8.5 mT since August; lowest ever

2004-09 Average Steel Scrap Pricing in Philadelphia



#1 Bundles
@ \$100/ton
Jan. 2002

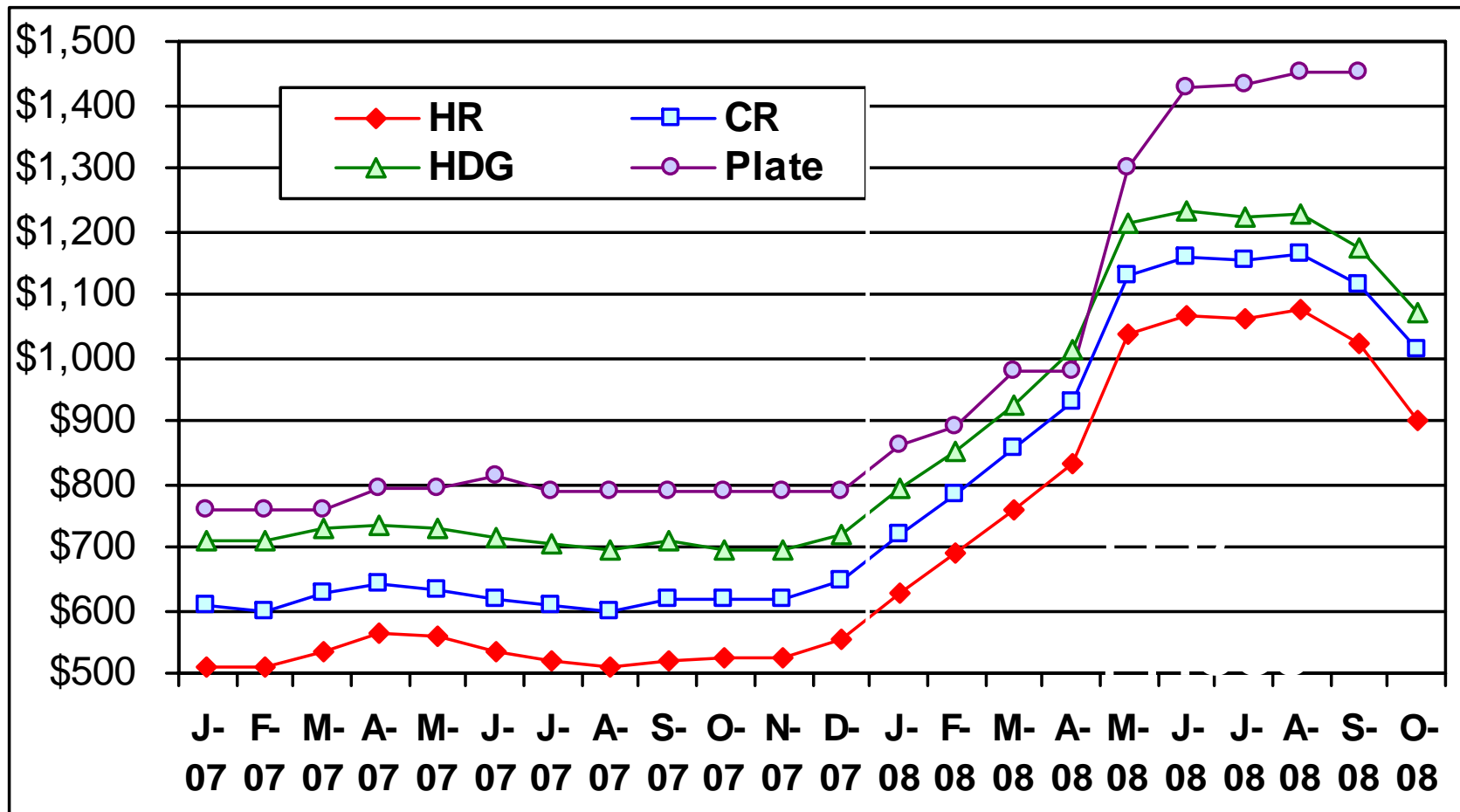
Steel Pricing of HRB



CRU Base Price & Input Costs

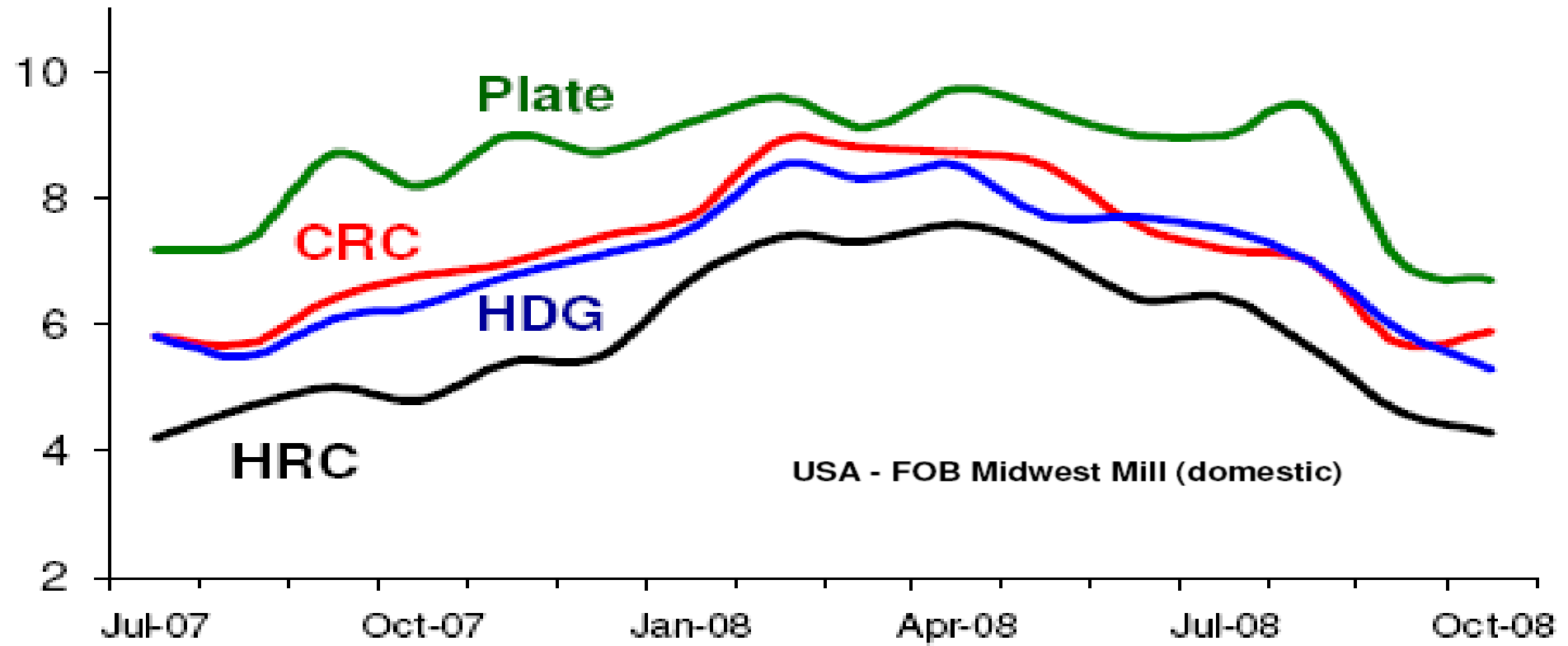


CRU (Midwest) : \$/s.ton



Supply: Production & Order Book

Average Delivery Lead-Times - USA (Weeks)



USA - FOB Midwest Mill (domestic)

Questions?

The New Steel



Latest Steel Bridge Information

www.steel.org