ICSG Insight

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An Alternative Way of Calculating Refined Copper Use: Application for China

1. Executive Summary

This Insight presents an alternative methodology to measure refined copper use, estimated as a residual of copper in apparent use of copper and copper alloy semi-fabrication net of scrap direct melt, both in copper content. The paper also discusses limitations and advantages of the alternative method proposed to measure refined copper use. An application of the methodology to refined copper use in China is included using data from ICSG and different sources. We review different sources of copper and copper alloy semis fabrication and net imports data for China for recent years, in both gross weight and copper content. Based on this review we develop estimates of domestic use of copper and copper alloy semi-fabricated production for China in recent years (2007-2010). Finally, based on estimates of copper content of scrap in direct melt and semis production, we obtain preliminary estimates for refined copper usage based on estimates of use of copper in the scrap directly melted by semis fabricators. This method complements the estimates based on apparent refined copper usage, but depends on good direct melt scrap estimates, a topic that requires primary data from fabricators. Ongoing ICSG research based on direct surveys of Chinese semis plants will allow us a more detailed estimate in the near future. A topic that may require more work and surveys to improve current knowledge of the Chinese copper market is how much copper and copper alloy product is effectively used or stocked by Chinese copper end users and how large stocks of semis products are in China. Different methodologies are coincident to produce an estimated 6.5 Mt-Cu of refined copper use in China copper and copper alloy semi-fabricators in 2009. Estimates reveal a jump of more than 1 Mt-Cu in the use of refined copper by Chinese semis in 2010.

2. Measuring Refined Copper Use Instead of Demand

As statistics are not publicly available for most countries, ICSG does not publish refined copper use: instead of it calculates “apparent refined usage”, an estimate of refined copper demand data in a regular and systematic way, discounting known stocks from the refined copper production net of refined copper imports. Apparent refined usage is a useful estimate of refine copper demand, mainly because of the simplicity of its calculation; it does not however allow us to know if the refined copper produced domestically or imported has been effectively used or has been added to unreported stocks. Some upstream copper industry representatives have suggested that ICSG may use its improving data on the use of copper

scrap directly melted by fabricators in some countries, with the objective to approximate a figure closer to the effective refined copper usage for some important users and in particular for China. This may eventually serve as a base of comparison with the apparent usage calculation currently employed to measure refined copper demand.

3. Methodological Issues

The methodology to estimate refined copper use looks to obtain an estimate of effective copper use in copper and copper alloy semi-fabricated products. If we can obtain or estimate the copper content in the apparent use of the copper semis production in a certain country, and if we count with accurate estimates of copper content in the scrap directly melted to produce semi-fabricated products in this country, we then discount the copper in the direct melt from the apparent end use of all copper semi fabricated products in the country to obtain an estimate of the refined copper used downstream in the country, or stocked in semi-manufactured products and end use products. This measure of effective use of refined copper can then be compared to our estimates of copper demand based on the "apparent refined use" method and we can obtain an estimate of unreported refined copper stocks or destocking process in the country we are studying.

4. Refined Copper Use from Semis Use Net of Direct Melt: Limitations and Advantages

Calculating refined copper use will require estimations of copper content in semis production in some countries, and also an estimation of the apparent use of copper in semis is needed. In consequence errors in the estimations will affect the accuracy of the refined copper use figures obtained. Nevertheless it may contribute to have a better picture in countries with accurate figures, and also can help to promote better statistics in countries with weaker data promoting the use of field surveys in industry associations and statistical agencies. The only well known and widely published data on non copper content in semis production has been produced by US CDA for the United States, using direct information from fabricators and allowing to know the use of other non ferrous metals as tin, zinc and nickel in the United States industry. To achieve this level of knowledge of the copper content in gross weight production in other countries requires systematic surveying of a representative sample of copper wire rod and brass mills. In 2011 ICSG commenced a survey of 70 brass and wire rod mills in China. The outcome of the survey will allow us to have an empiric backup to check empirically the outcomes of refined use calculations based on copper semis use net of direct melt scrap. A cost effective alternative is the development of accurate estimates of metal content on a country by country basis.

5. Current Gross Weight Semis Production Capacity in China

The first use of copper in China is a key driver of the global copper market and a central variable to make investment decisions upstream in the value chain at copper refineries, smelters, mines and even for exploration budgets. The ICSG database of copper first users in China, updated and published at the end of 2010, covers a total of 496 plants with total capacity of 12,647 kt of potential gross weight production per year. More than 80% of the semis producers are small scale plants with annual capacity below 30kt. Jiangsu, Zhejiang, and Guangdong are the major 3 provinces for copper first use capacity with almost 53% of

China copper first use capacity. We have information on 207 Chinese wire rod mills with total capacity of 7,158.4 kt. There was an impressive 1,150 kt additional new wire rod capacity under construction in 2010 that is expected to be operational in 2011. The brass mill capacity of the Chinese economy reported to ICSG in 2010 is almost 5.5 Mt in gross weight and covers 25 alloy wire mills, 121 tube mills, 78 plants producing rod, bars and strips (RBS) and 115 plants producing plate, sheets and strips (PSS) mills. In 2010 we found 290 Kt of new PSS production capacity under construction in 7 plants, plus 110kt of copper tube capacity and two RBS mills new projects under construction. The strong capacity expansion of the copper and copper alloy semi-fabrication industry in the last five years in China looks to be facing a peak. A consolidation process of a largely fragmented industry has started with the top five wire rod makers accounting now for 26% of China wire rod capacity, the top three tube producers accounting for over 30% of China tube capacity and the capacity of the top three PSS producers accounting for around 20% of total China PSS production capacity.

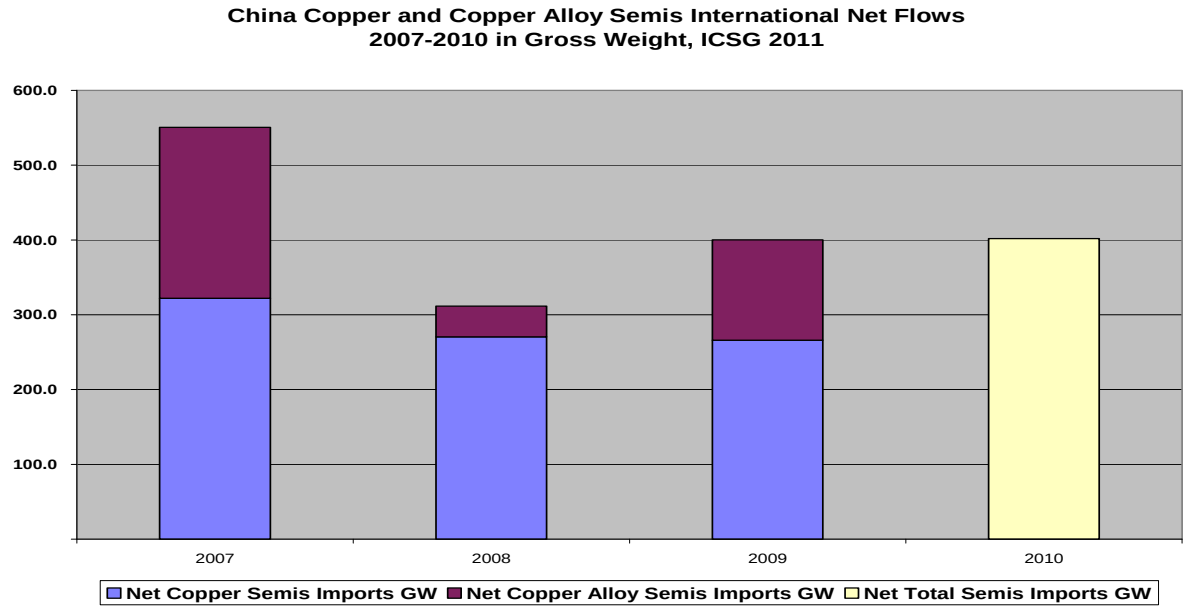
6. Gross Weight Official Semis Production Statistics for China: Recent Figures

Copper and copper alloy semis fabrication figures published in gross weight, regularly by ICSG are the official monthly figures published by China Non Ferrous Metals Industry Association (CNIA) and updated afterwards with an official annual figure reported at the end of the next year by CNIA. CNIA final official semis production figure for China for 2009 was 8.73 Mt gross weigh, and preliminary official data was 10.09 Mt gross weigh for 2010. It is not common practice for most of statistical agencies around the world to publish copper content statistics of copper semi-fabrication, or copper content in copper alloy ingots and foundries production; in consequence ICSG does not publish copper content estimates of copper first use in China or elsewhere. Other figures of Chinese semi-fabrication are published regularly by different copper consultants and industry associations.

7. Chinese Demand for Copper Semis Products in Gross Weight 2007-2010

Net import flows of copper and copper alloy products going to China are estimated using ICSG gross weight figures. The net flow of semis products remained positive through 2007-2010 with lower net flows of copper alloys in 2008-2009 revealing the problems in the scrap market associated to the collapse of fabrication ex-China, but only-copper semis net inflows remained stable along the crisis. If we add semis production and the net imports of copper and copper alloy semis in China for 2007-2010, both in gross weight, we can have an idea of the evolution of the demand for semi-manufactures in China, going to end use or to stocks of semi-fabricated products or end use products, without using any assumptions about copper contents. We found that after a very high expansion in demand for semi-manufactures in 2008, the demand for copper and copper alloy products fell to around 5% in 2009 meanwhile the recovery in the demand was close to 15% in 2010.

China: Domestic Demand for Copper and Copper Alloy Semis 2007-2010				
Thousand Metric Tonnes Gross Weight				
	2007	2008	2009	2010
China Cu&Cu Alloy Semis Production GW	6,302.1	8,367.0	8,736.0	10,092.7
Net Copper Semis Imports GW	322.2	270.5	265.9	
Net Copper Alloy Semis Imports GW	228.5	40.9	134.2	
Net Total Semis Imports GW				401.9
China Apparent End Use of Semis GW	6,852.8	8,678.5	9,136.1	10,494.6
Annual Growth of Semis Demand GW		26.6%	5.3%	14.9%



8. Copper Content Estimates for China Copper Products 2002-2009

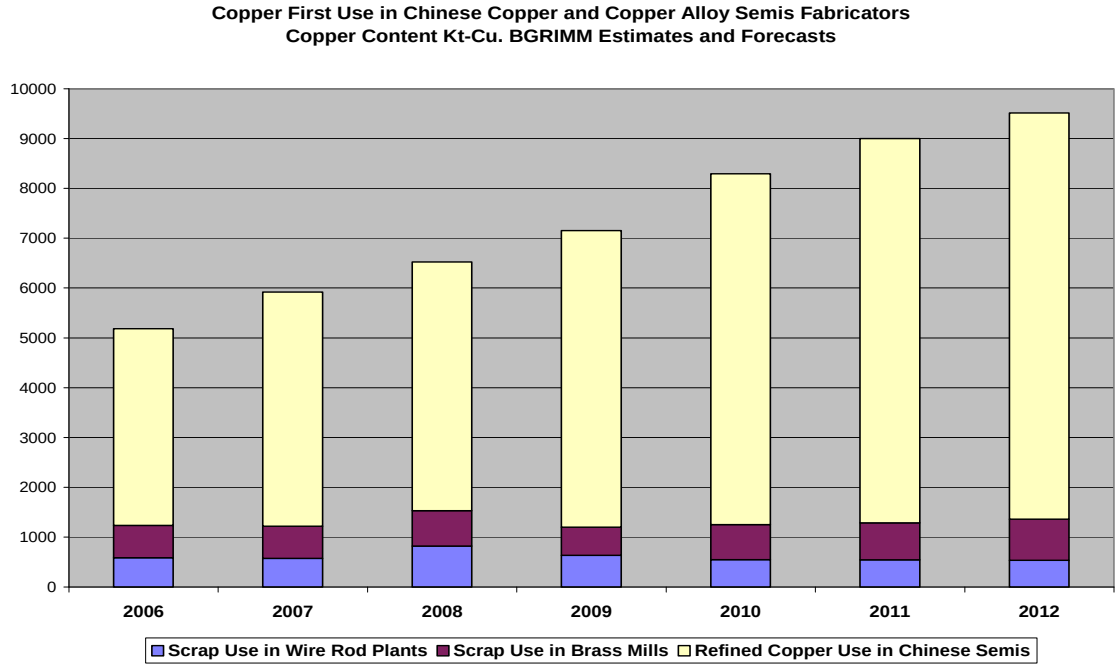
To estimate the copper content in Chinese products of semis, foundries and ingot plants we made some assumptions. We started with the official production of semi-fabricated products containing only copper, then we added copper alloy semis production assuming a 70% of copper content. Then we assumed that 85% of the semis production was copper when we had no specification of copper alloy semis production as is the case for 2009. We added copper in Chinese foundry production assuming that 80% was copper content and finally other copper products where included. We found that the total copper content in semis, foundries and ingots was growing at two digit rates in 2003-2008 in China, then we observe a slight fall in 2009, probably related in part to the fact of not having a breakdown between copper and copper alloys for this year and in part to the slowdown in the industry in the first half of this year. There is not enough updated information currently to extend the estimate to 2010, but copper content in semis production was expected to growth at two digits again as observed in official gross weight figures and estimates from other sources.

China: Estimate of Copper Content in Total Copper Products 2002-2009								
	Kt-Cu							
	2002	2003	2004	2005	2006	2007	2008	2009
Copper in Products	3108.5	3771.5	4382.1	4885.0	5393.2	6300.2	8120.1	8027.6
Annual Growth %		21.3%	16.2%	11.5%	10.4%	16.8%	28.9%	-1.1%

9. Copper Content Estimates for China Copper and Copper Alloy Semis Production

Copper content in Chinese copper and copper alloy semis production for recent years has been estimated by BGRIMM and Antaike, two main metal research centers in China. Copper content data does not show significant differences between them, but BGRIMM has the advantage of using western semis classification standards, even when both agencies recognize taking account of double counting situations for semis production in official figures. Copper content in 2009 semis production increased 10% by BGRIMM in relation to 2008, to more than 7.1 million tonnes of copper, and grew more than 16% to almost 8.3 million tonnes of copper content in 2010.

China: Copper Content of Cu & Alloy Semifabricated Production Copper Content (Kt-Cu) estimates and Forecasts from BGRIMM			
	2009	2010	2011
Wire Rod	4564	5203	5672
Copper Tube	812	1024	1106
Copper alloy plate, sheet & strip	434	538	581
Copper plate, sheet & strip	386	463	491
Copper alloy rods, bars & sections	401	461	498
Copper alloy tube	178	178	192
Copper Alloy Wire	141	161	174
Copper rods, bars & sections	135	151	158
Castings	100	120	130
China: Cu Content in Semis Production	7151	8299	9002
Annual Growth	10%	16.1%	8.5%



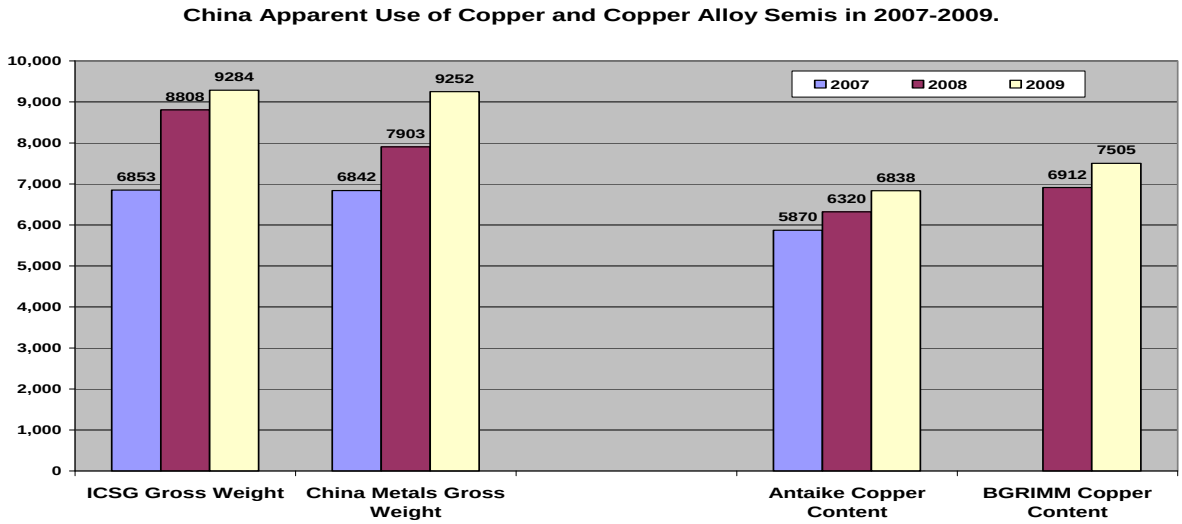
10. Apparent Use Estimates for Copper and Copper Alloy Products in China

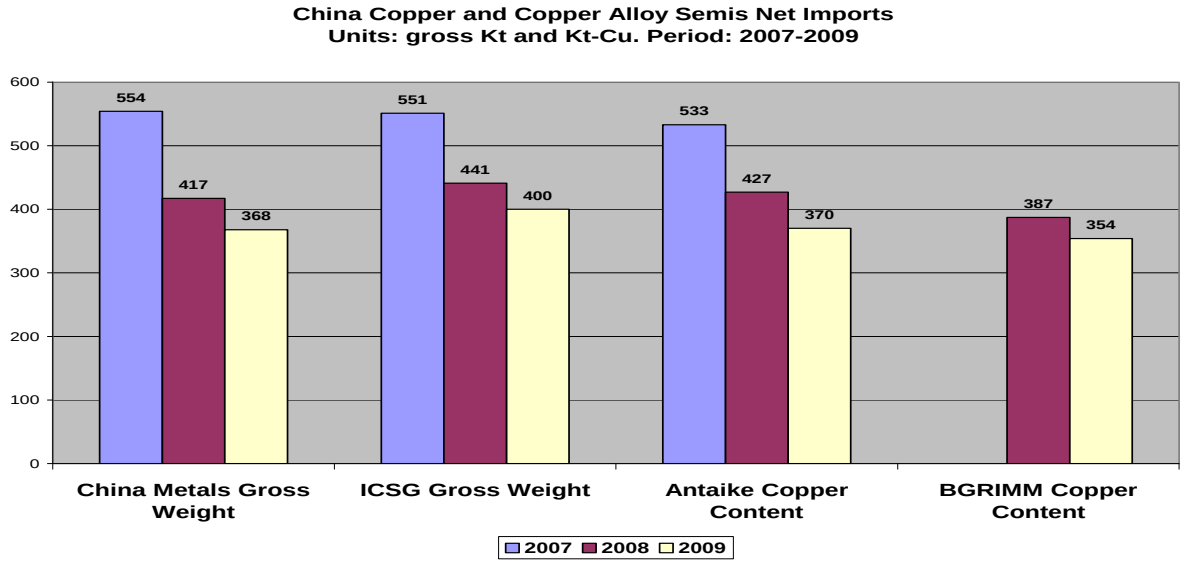
We observe that the trend in the Chinese demand for copper and copper alloy products has been upwards in the three years before 2010, even if we assume some degree of stock accumulation of semis products in China. The 2009/2008 rate of growth of apparent demand for semis products in copper content estimated by Antaike (+8.2%) and BGRIMM (+8.6%) are not very different. In studies contracted by ICSG with Antaike and BGRIMM and in their own publications both sources agree that copper content in Chinese semis demand increased around 2% in 2009/2008. Along 2010 BGRIMM has been increasing its estimates of copper content in China semis production to 7.1 Mt-Cu for 2009 and to 8.3 Mt-Cu in 2010. Assuming that there are not significant double counting situations for semis production in official figures, assuming 85% of copper content in gross weight semis production, and assuming 90% copper content in the net inflow of semis imports to China in 2010 our estimate of copper in semis production and demand is higher. In consequence the double counting risk needs to be considered carefully and also the validity of the assumptions in the copper content estimates.

China: Estimated Copper Content in Semis Demand 2007-2009

Kt-Cu

	2007	2008	2009	2010
Copper Content in Semis Production Assuming 85% Cu (Kt-Cu)	5,356.8	7,112.0	7,425.6	8,578.8
Net Copper Semis Imports Kt-Cu	322.2	270.5	265.9	
Net Total Copper Alloy Semis Imports Assuming 70% Cu (Kt-Cu)	159.9	28.7	94.0	
Copper Content in Net Total Semis Imports Kt_Cu (Est.)	482.1	299.2	359.8	361.7
Copper Content in Semis Demand (Kt-Cu) (Est.)	**5,838.9**	**7,411.1**	**7,785.4**	**8,940.5**
% cu in net semis imports (Est.)	0.88	0.96	0.90	0.90



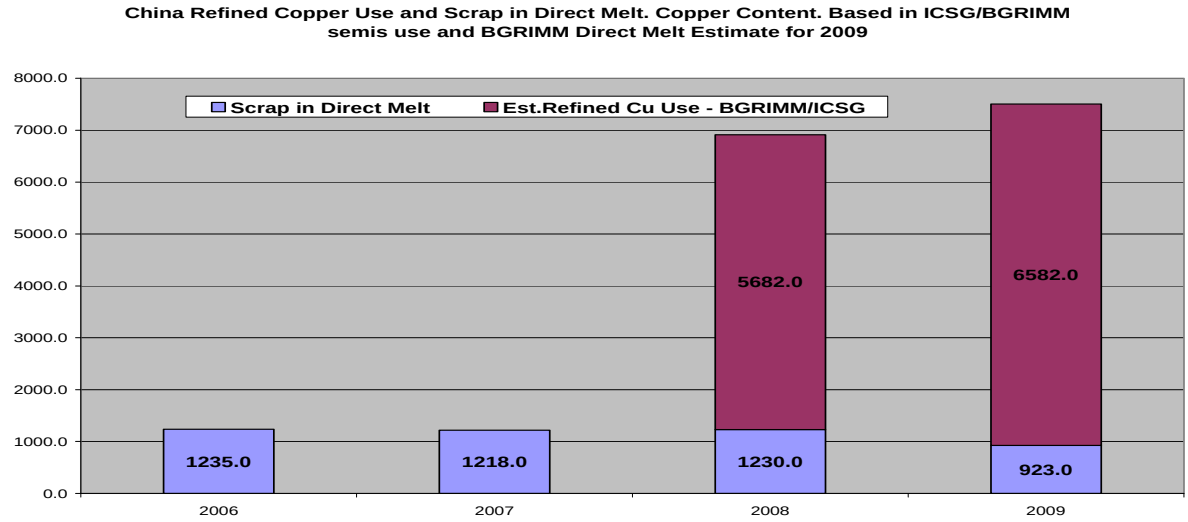


11. Estimating Refined Copper Use from Semis Production and Scrap Use in China

Using the estimates of copper content in semis demand from BGRIMM, Antaike, and ICSG based on official sources and the above assumptions and using data on copper in direct melt obtained from the ICSG Copper Scrap Research Project (2010) and from recent BGRIMM estimates for China, we obtained estimates on total refined copper use in Chinese copper and copper alloy fabricators. First we used Antaike copper content estimated for ICSG in China semis use and we discounted BGRIMM estimates of copper content in scrap directly melted by semis in China prepared for ICSG in the scrap research project. The estimate of refined copper use based on semis fabrication (and not in apparent use) has been growing fast in recent years, from more than 4.6 Mt-Cu in 2007 to more than 5.9 Mt-Cu in 2009. To cross check those findings we used BGRIMM estimates of copper content in China semis use and we discounted their estimate of copper content in scrap directly melted by semis. If we use BGRIMM's more optimist copper content in semis use, the effective refined copper use should have been growing even faster: from more than 5.6 Mt-Cu in 2008 to more than 6.5 Mt-Cu in 2009. Finally if we use BGRIMM's latest copper content in direct melt in brass mills and wire rod plants, together with the assumptions on copper content in semis use explained in the previous section and official figures where double counting is not considered, refined copper use estimates are even higher: from 5.9 Kt-Cu in 2008 to 7.7 Mt-Cu in 2010.

China: Refined Copper Use Estimate 2007-2009				
Kt-Cu				
	2007	**2008**	**2009**	**2010**
Copper in Wire Rod Direct Melt: BGRIMM Est. Kt-Cu	643	710	568	703
Copper in Brass Mills Direct Melt: BGRIMM Est. Kt-Cu	575	820	633	548
Refined Copper Use Estimate Kt-Cu	4,620.9	5,881.1	6,584.4	7,689.5
Annual Growth		27.3%	12.0%	16.8%

Note: does not consider double counting. Based in BGRIMM direct melt estimates. Assumes certain %cu in copper demand



12. Conclusions

Different methodologies are coincident to produce an estimated 6.5 Mt-Cu of refined copper use in China copper and copper alloy semi-fabricators in 2009. Estimates reveal a jump of more than 1 Mt-Cu in the use of refined copper by Chinese semis in 2010. Calculating refined copper use based on copper content in semis production net of copper content in scrap direct melt implies a high degree of estimation and the result is subject to certain degree of risk, but certainly this risk can be reduced with more surveys and communication, meanwhile the uncertainty of apparent refined usage is not able to be reduced. Even when there is not agreement in the absolute level of refined copper use and copper in the direct melt scrap, the three estimates are coincident to reveal a significant growth in refined copper use and limited stockpiling of refined copper in China semi-fabrication industry in recent years. What happens with semis production downstream in manufacturers, other end users and warehouses in China needs more research efforts in the future. A more precise estimate of effective refined and scrap copper use should be based on a regular and extensive direct survey of refined and scrap use to a large sample of Chinese copper and copper alloy semis fabricators. A first step is the ongoing 70 plants survey under implementation by ICSG in 2011.

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