

## Worldwide market of manganese ore and ferroalloys in the fourth quarter of 2013



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### Abstract

*Ukraine, as for assured resources of manganese ore, takes the 2<sup>nd</sup> place after Republic of South Africa; it is a large manufacturer of raw materials and ferroalloys and one of the leading competitors on the worldwide market of manganese-ore materials and ferroalloys [1,2].*

*Performance of analysis of market situation and estimation of sources reliability concerning prices for these products, which became the topic of this article, is of practical interest.*

### Market of manganese materials

Known to many specialists edition "**CRU Bulk Ferroalloy Monitor**" publishes information about two types of prices for manganese ore: 1) averaged prices of imported spot transactions excluding loading port in terms of the ore with 44% manganese content; 2) averaged prices according to transactions, including loading port per month, preceding summary, in terms of 43% manganese content, CIF China. But, we believe that, being averaged and not considering the data concerning loading port or reflecting just one direction of delivery, the data of this edition cannot be applied for reliable estimation of concrete ore cost and may be only used as informational material.

"**Metal-Ekspert**" edition publishes the data about three types of prices: 1) price for import of Australian ore with 48% manganese content to China on CIF-China terms (without fixing a port) 2) price for import of Australian ore with 46% manganese content to China on CIF-China terms (without fixing a port); 3) price for import of Kazakh ore with 38-40% manganese content to China on CPT terms.

It should be marked that these data do not take into account shipping port and also reflect only one direction of the delivery – CIF-China, without fixing certain port; that is why these data cannot be used for reliable estimation of concrete

ore cost and may be only used as a review (referential).

"**Ryan's Notes**" edition publishes prices for manganese ore (36-39%; 44%; 46% Mn) delivered on the market of North America.

Since 19<sup>th</sup> October "**Metal Bulletin**" source has stopped publishing averaged prices for manganese ore without fixing certain shipping port. The data published concern two types of prices:

1) Manganese Ore Price Index for the ore with 38% manganese content on the terms of FOB Port Elizabeth, in dollars for 1% of manganese, contained in one ton of ore (concentrate or agglomerate) on dry basis (dry metric ton unit (dmtu) index). Please note that this approach is quite sound, as Republic of South Africa is the world's largest producer of iron ore with middle and high content of manganese, seaborne (according to "Global Trade Atlas" data, export of manganese ore from Republic of South Africa in 2013 made 9.7 million tons).

2) Manganese Ore Price Index for the ore with 44% manganese content on the terms of CIF Tianjin in dollars for 1% of manganese, contained in one ton of ore (USD/dmtu). We believe, this approach is also rather sound, as China is the world's largest consumer of manganese ore. According to "Global Trade Atlas" data, import of manganese ore to China in 2013 made 16.6 million tons, herein 31% fell on the Republic of South Africa ore, and 31% - on the Australian ore. Here one should consider that Tianjin is not the only transshipment port for

manganese ore to China, total reserves of this ore in China ports teetered between 2.29 -3 million tons during 2012-2013. The cost of delivery and transshipment of manganese ore through China ports may vary depending on some factors.

In such a way, in our opinion, namely indexes of “*Metal Bulletin*” edition characterize global market trends the most precisely and reasonably reflect the dynamics of international prices for manganese ore. On this basis, while comparing the prices for manganese ore, imported on the territory of Ukraine, to use “*Metal Bulletin*” indexes is the most reasonable.

Herein, for reasonable comparing the prices, the last should be at least: *first*, they should be determined on the equal basis of delivery; *second*, they should set for commodities equal in quality; *third*, they should be in the same equality.

In order to make the prices for ore “comparable”, it is possible to apply specifically developed recosting methods.

With the aim to render the price, reflecting the world level, (for example, on CIF terms, China port) as targeted price (for example, CPT-railroad station of Black Sea port), principal associated costs must be held back and/or added to “international price”.

According to the example given above, the price arithmetic formula will be as follows:

$$P_{Urk} = P_{Ch} - C_1 + C_2 + C_3$$

where:  $P_{Urk}$  - price for manganese ore, CPT-railroad station, Ukrainian port;

$P_{Ch}$  - price for manganese ore, CIF China port;

$C_1$  - shipping costs from the port of state of origin of the cargo under consideration to China port (redatuming from CIF China to FOB country of cargo origin);

$C_2$  - shipping costs from the port of state of cargo origin to the Ukrainian port (redatuming from FOB, country of cargo origin to CIF, Ukraine);

$C_3$  - cargo transfer from the warehouse of Ukrainian port to the wagons at port railroad (redatuming from CIF, Ukraine to CPT, Ukrainian railroad port).

While performing accounting all the costs should be given in the same pecuniary unit; generally accepted world pecuniary unit concerning manganese ore is the sum in dollars for 1% on manganese, contained in one ton of ore - USD/dmtu.

Price recosting methodology of shipped manganese ore of one type to another type of the similar good is based on the principal of proportional price change, depending on the content of main element (Mn%). For example, recosting of price for manganese ore with 44% Mn content, with the price for 1% of manganese, contained in one ton of ore, equals 5 USD/dmtu, to the price for ore with 40%Mn. We use the following formula for recosting:

$$P = 5 : 44 \times 40 = 4.55 \text{ USD/dmtu}$$

Inaccuracy of this recosting methodology usage is connected with the fact, that, herewith, the content of basic element is taken into account and the content of harmful impurities (phosphorus, sulfur, etc) is ignored. Moisture content, ignition losses, fineness ratio, mineralogical composition of ore material and gang mineral, etc – all these factors are also ignored, values, which significantly influence the technical-economic values (TEV) of ore processing on ferroalloy enterprises.

Application of method of proportional recosting concerning manganese content for ores with manganese content not lower than 44% requires the appliance of adjustment factors. For each type of ore the value of coefficient depends on concrete situation, in particular requirements to the quality of output. For example, in Ukraine for filling of order for manganese ferroalloys smelting with high content of manganese and low content of phosphorus, there is a need in raw materials with low content of phosphorus and iron.

Qualitative characteristic analysis of manganese ores from different deposits in different countries shows that manganese ore from **Ghana** is almost world's only manganese ore with manganese content lower than 40% and which possesses both properties. Considering different positive moments, but rather low manganese content (28%Mn), for this ore is acceptably to use 1.20-1.30 scaling ratio, depending on the current situation on the market and with account of availability and price level of other similar ores.

There are supplies of manganese ore with relatively low manganese content and high iron content from **Republic of South Africa**. Such ores at the moment are presented on the worldwide market by such producers as **BHP**, **Assmang**, **UMK**, **Tshipi**. It is known, that for carbonates decomposing, while ferroalloy smelting, there is a need in additional electrical

power in electric furnace [1], but stable chemical composition and low moisture content in this ore (this fact sufficiently influences transportation costs of manganese unit) allows to apply 0.95-1.05 scaling ratio.

According to *Metal Bulletin* information, real cost situation on the market of manganese ore, was characterized by multidirectional trends in September 2013. Prices for South African manganese ore with 38% manganese content were continuing to grow: from 3.35 USD/dmtu to 3.64 USD/dmtu on the terms of FOB, Elizabeth port. Price indexes started growing since the 6<sup>th</sup> of September, when the prices for manganese alloys in China have heightened. It should be noticed that the prices for manganese ore with 38% manganese content were reducing within several months in connection with weakening of ZAR Rand and as a result the producers in Republic of South Africa were forced to cut the volumes of material suggested for curbing the price drop. Price index according to *Metal Bulletin* for the ore with 44% Mn, by contrast, was reducing from 5.15 to 5.11 USD/dmtu on the terms of CIF Tianjin; this is connected with weakening of demand for this ore grade.

In October, 2013 price index of *Metal Bulletin* for South African manganese ore with 38% manganese content increased from 3.73 to 3.82 USD/dmtu, but in November, 2013 slowly returned to the level of beginning of October. Similar situation was observed concerning index of this edition for the ore with 44% manganese content: rise in October, 2013 from 5.19 to 5.23 USD/dmtu succeeded by rollback in November, 2013 to the level of 5.15 USD/dmtu. Consumers have fulfilled earlier shortened ore reserves. Some Chinese traders have declared, that they have overestimated the demand for manganese ore, the number of spot transaction was very small, and as a result the received to Chinese port material were purchased more slowly, than it was expected, this has affected the price curve.

In December, 2013 price index of *Metal Bulletin* for South African manganese ore with 38% manganese content in the run-up to Christmas holidays, remained stable on the level of 3.7-3.71 USD/dmtu, and price index for ore with 44% Mn continued reduction from 5.12 to 5.08 USD/dmtu.

When using abovementioned methodology, it is easy to show that while this period (September, 2013) for the ore from Republic of South Africa with 37% manganese content at *real price index*

of *“Metal Bulletin”* edition 5.11 USD/dmtu, *calculative price* for analogue on the terms of CPT, Ukrainian port station while using 1.0 coefficient makes 5.00 USD/dmtu. For *Ghana* ore with 28% Mn at *real price index* of *“Metal Bulletin”* edition 5.11 USD/dmtu, *calculative price* for analogue on the terms of CPT, Ukrainian port station while using 1.3 coefficient makes 4.81 USD/dmtu.

In performed calculation of transshipment rate the results obtained with the help of shipping agents questionnaire in the Ukrainian ports; freight rates are calculated on the basis of *“BALTIC EXCHANGE”* indexes and fuel cost at a given period of time.

## 2. Ferroalloy market

The leading competitor of world market of ferroalloys, doubtless is China, where in recent years app. 45% of world volume of ferroalloys is produced, which are used both for smelting in great volumes of steel by Chinese metallurgists and for export.

Since 1<sup>st</sup> January 2008 the Chinese government has imposed special export tariffs for certain products through the program concerning removal from service of outdated and unsustainable manufacturing facilities in the country. As of September-October, 2013, export tariffs for Chinese ferroalloys were: 20% - for ferrosilicon manganese and ferromanganese, 25% - for ferrosilicon; since 1<sup>st</sup> January, 2013 export tariff for metallic manganese has been canceled.

As a result of imposition of export duties, Chinese ferroalloy export reduced significantly. Ferrosilicon manganese export reduced from 740 000 tons in 2008 to 17 000 tons in 2013, i.e. 44 times; high-carbon ferromanganese export decreased from 180 825 tons in 2008 to 5 195 tons in 2013, i.e. 35 times; intermediate- and high-carbon ferromanganese reduced from 184 407 tons in 2008 to 6 539 in 2013, 28 times. There marked facts of reexport of Chinese ferroalloys lots through Vietnam, in order to avoid export duty.

Export-import statics shows that under actual low level of export, the prices for ferroalloys on FOB terms, China, which are published both by Chinese and international sources, do not reflect market trends, but are of informational nature, demonstrate “artificial” level (according to analysts estimation), according to which Chinese part *could* offer ferroalloys at outside market allowing for export duty (20-25%). In such a manner, prices published on FOB terms, China

*should not* be accepted as the base while estimation of costs of ferroalloys delivery at the world market.

For understanding which sources are able to reflect price trends correctly, let us pay attention to the world export-import statistics concerning ferroalloy trade for 2008- 2013 (*see the given above note*).

The largest exporters of *ferrosilicon manganese*, according to *Global Trade Atlas* data, are India (in 2013 – 955.6 ths tons), Ukraine (466.6 ths tons) and Norway (281.9 ths tons); this data should be taken into account. In 2013 Russia exported only 139 tons of ferrosilicon manganese, importing more than 180 ths tons of this alloy, mainly from Ukraine (138.8 ths tons). Therefore, export prices for ferrosilicon manganese, published by Chinese source “Asia Metal” on FOB terms, Black Sea port of Russia, are incorrect and are not recommended for usage while trends evaluation on the market of Russian Federation.

The largest exporters of *high-carbon ferromanganese* are Republic of South Africa (2013 – 525.4 ths tons), South Korea (170.9 ths tons), India (140.3 ths tons), Russia (54.6 ths tons) and Spain (39.7 ths tons). The leading exporters of *intermediate- and low carbon ferromanganese* are Republic of South Africa (2013 – 118.2 ths tons), South Korea (102.1 ths tons) and Spain (28.6 ths tons).

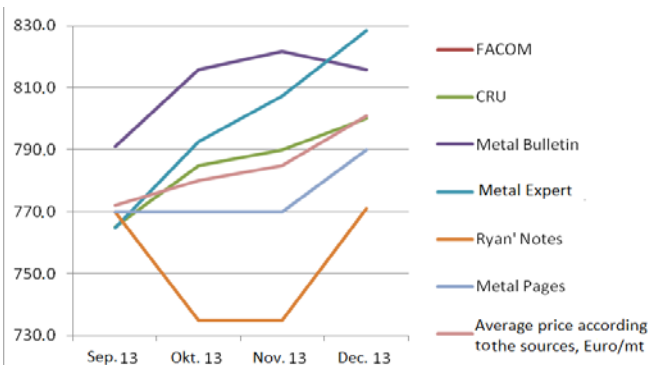
The main *ferrosilicon* exporters are Russia (2013 – 397.7 ths tons), Norway (204 ths tons), Iceland

(119.3 ths tons), Brazil (98.7 ths tons), Ukraine (64.7 ths tons) and China (reexport through Vietnam).

The most active importers of *ferrosilicon manganese* over a period of September-December of 2013, were Japan, Turkey, Russia, Italy, USA and Great Britain; all these countries and also Iran appeared to be the main importers of *high-carbon ferromanganese*; Canada may be added to this list as for *ferromanganese* import with less than 2% of carbon. All these countries were the main importers of *ferrosilicon* in September-December, 2013.

Considering the above mentioned, one may conclude that while analysis of price level for ferroalloys, one should found on the sources, which give prices on DDU - Europe, FOB –ports of India and South Korea, CIF- Japanese ports, DDU- USA market (North America), DDU- Russian market basis.

Let us consider price information on the main markets of ferroalloys in September-December 2013 according to *FACOM* (as we mentioned above, this price is artificial and further it is given as informational), “*CRU Bulk Ferrolloy Monitor*”, “*Metal Bulletin*”, “*Metal Expert*” (*russ.* “*МеталлЭксперт*”), “*Ryan’ Notes*” editions data. In figure 1 there is data concerning dynamics of prices for ferrosilicon manganese in accordance with information of mentioned above sources on European markets.



As one may see from data, presented in the figure 1, the edition “*CRU Bulk Ferrolloy Monitor*” reflects the market trend of average price for ferrosilicon manganese on the European market the most precisely; one may also consider as comparatively accurate information, the data of “*Metal Bulletin*”, “*Metal Pages*” and “*Metal*

**Figure 1** Dynamics of prices (Euro/mt) for ferrosilicon manganese on the European market in September-December 2013

“*Expert*” editions. The difference in data of these sources may be conditioned

by the presence or absence of minimum and maximum reflection in the edition, and also various periodicities (*Metal Bulletin* and *Metal Pages* publish data weekly, *Metal Expert* and *CRU Bulk Ferrolloy Monitor* – monthly) that affects calculation of average price per month.

Quite possibly that the presence of price range is connected with the information published, which does not reflect the content in alloy such important for metallurgists element as

phosphorus. It is obvious that production expenditures and prices for ferrosilicon manganese with 0.15-0.35% and 0.35-0.5% phosphorous content vary greatly, although the information about prices for these ferroalloys is considered according to the single category.

Dynamics of prices for high-carbon ferromanganese on the European market, according to the same sources, is shown in the figure 2.

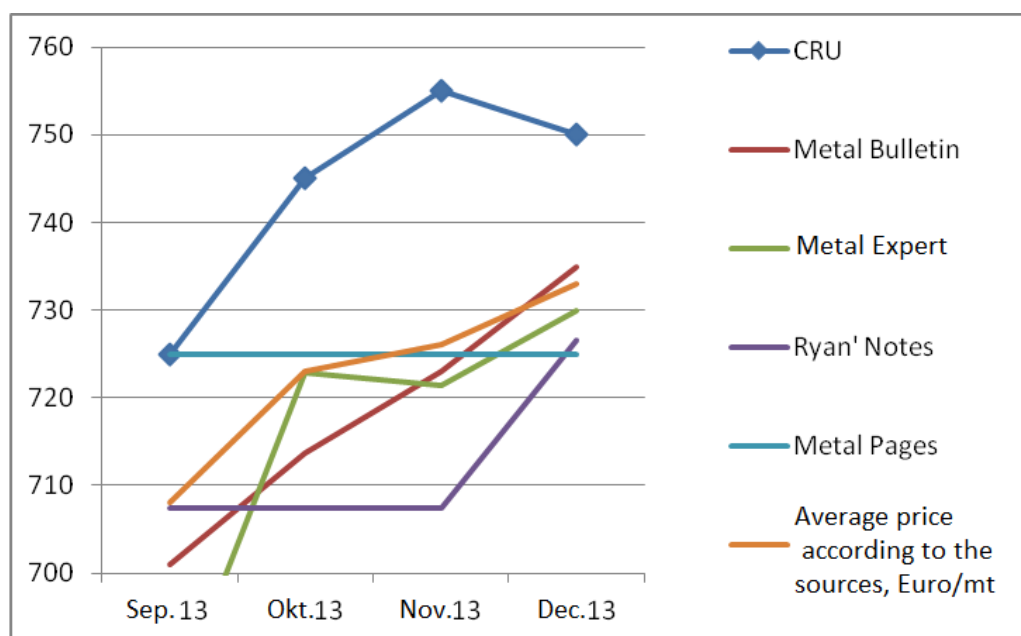


Figure 2 Dynamics of prices (Euro/mt) for high-carbon ferromanganese on the European market in September-December 2013

As it may be seen from the data in the figure 2, the edition “*Metal Bulletin*” reflects the prices for high-carbon ferromanganese on the European market the most precisely, one may also consider as comparatively accurate information, the data of “*Metal Expert*” edition. On our opinion, not exact data concerning market trends is provided by “*Ryan' Notes*” and “*Metal Page*” editions. The reasons of variations in prices for ferromanganese, according to different sources, are obviously the same as for ferrosilicon manganese.

In the figure 3 there is data about prices on the European market for intermediate-carbon ferromanganese, according to the data of *CRU Bulk Ferrolloy Monitor* and *Metal Pages*; the data about prices for this alloy and also low-carbon ferromanganese is published by *FACOM*, but as it was mentioned above, its data is artificial and may be used as informational only. As it is shown in the figure 3, “*CRU Bulk Ferrolloy Monitor*” edition reflects the price market tendency for middle-carbon ferromanganese on the European market the most

precisely, while “*Metal Pages*” edition reflects market trends incompletely.

Dynamics of prices on the European market of ferrosilicon, according to “*CRU Bulk Ferrolloy Monitor*”, “*Metal Bulletin*”, “*Metal Expert*”, “*Ryan' Notes*” and “*Metal Pages*” data, is shown in the figure 4.

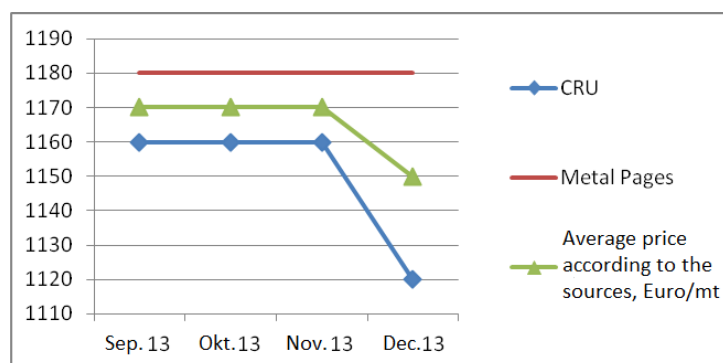
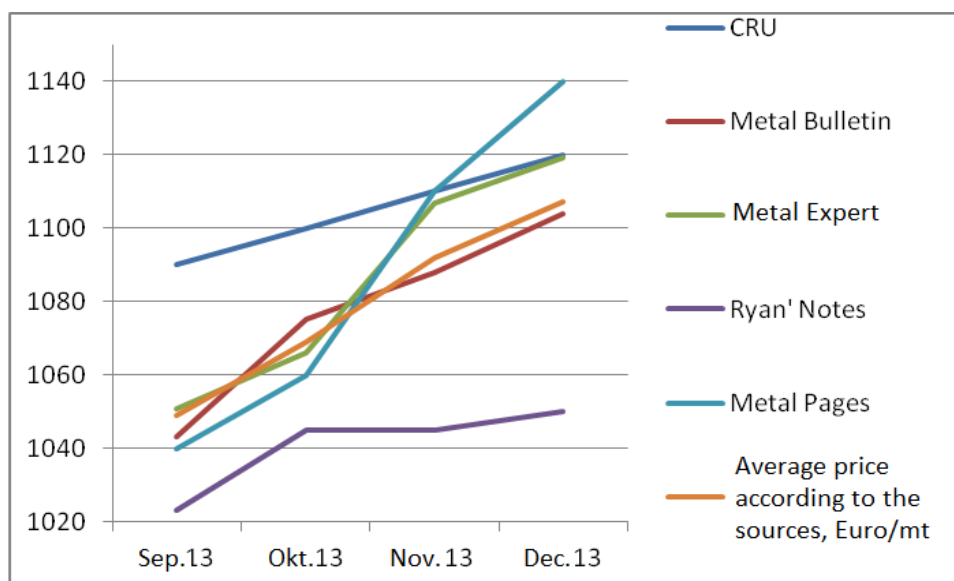


Figure 3 Dynamics of prices (Euro/mt) for intermediate-carbon ferromanganese on the European market in September-December 2013



**Figure 4** Dynamics of prices (Euro/mt) for ferrosilicon on the European market in September-December 2013

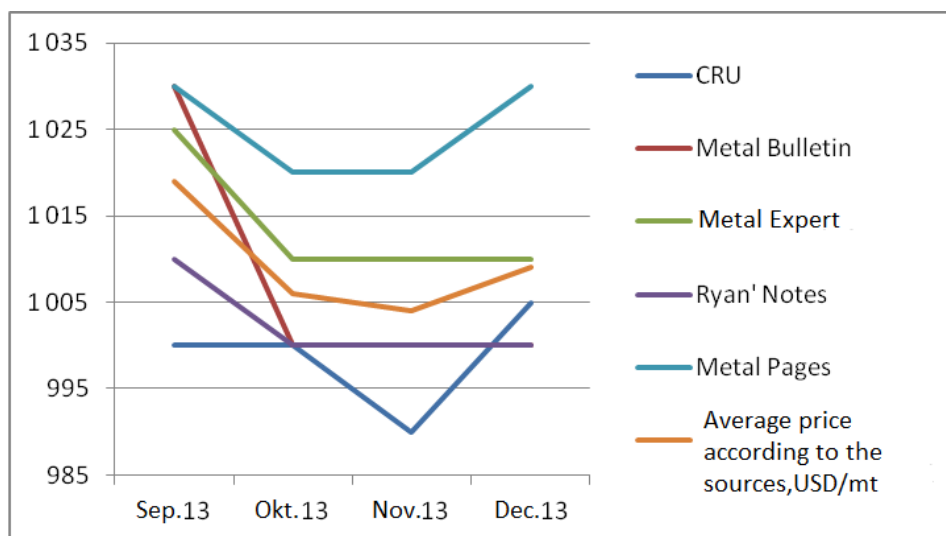
From the data in the figure 4 one may conclude that “*Metal Bulletin*” edition reflects price market tendency for ferrosilicon on the European market the most precisely, one may also consider as comparatively accurate information, the data of “*Metal Expert*” edition. The reasons of data variations are analyzed above and connected, first of all, with different frequency of the editions and absence of data about price extremum.

*Ryan's Notes*, *Metal Bulletin*, *CRU Bulk Ferrolloy Monitor*, *Металл Эксперт* и *Metal Pages* publish data about prices for ferrosilicon manganese on the USA market. During analysis of this data, one should consider that there is import tax (163%) for ferrosilicon manganese produced in Ukraine and China. In such a way,

prices, published by the specified editions for USA market, may be used as informational ones for evaluating the level of material cost on the markets of far-abroad countries.

Dynamics of prices in September-December 2013 for ferrosilicon manganese and high-carbon ferromanganese on the USA market is shown in the figure 5 and 6 respectively, and demonstrates various trends, not conforming to averaged revealed level.

When working with this price information, we recommend to base upon “*Ryan's Notes*” edition, as its central office is on the territory of USA; in such a way, analytics of this edition have close contact both with consumers and suppliers of ferrosilicon manganese on the US and North America markets. It is obvious, that this allows the edition to react in timely on the tendencies and publish the hardest news.



**Figure 5** Dynamics of prices (USD/mt) for ferrosilicon manganese on the USA market in September-December 2013

Information concerning prices on North American market of *intermediate-carbon ferromanganese* is published by *Ryan's Notes*, *Metal Bulletin*, *CRU Bulk Ferrolloy Monitor*, and data about *low-carbon ferromanganese* is published by “*Ryan's Notes*” edition, which data is recommended to use because of the mentioned above reasons.

The mentioned above concerning greater accuracy of *Ryan's Notes* data, because of the same reasons is true for price information on *the USA market of ferrosilicon*.

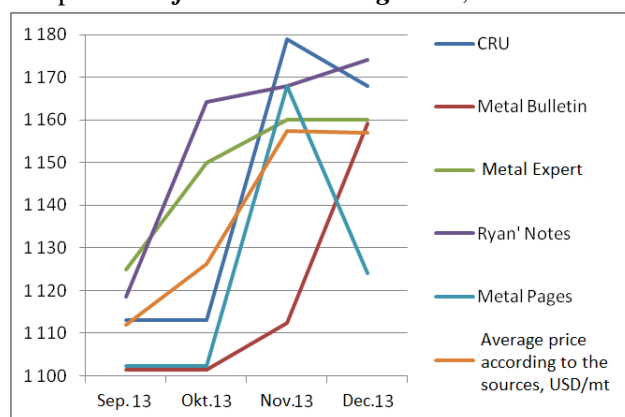
The data about prices for ferrosilicon manganese on the market of *Southeast Asia* is published by “*Tex Report*” edition (supplies of Indian material on the Japanese market), “*Metal Expert*” edition (South Korea, India), “*Ryan's Notes*” edition (China), “*Metal Bulletin*” edition (China), “*CRU Bulk Ferrolloy Monitor*” edition (Japan, China), “*Metal Pages*” edition (China). All the sources may be recommended for usage, except the data concerning China, which, as it was mentioned above, is of artificial character.

The same concerns publication of data about price for *high-carbon ferromanganese* on the market of *Southeast Asia*, where we recommend to use such sources as “*Metal Expert*” and “*Metal Pages*” editions. As for data about prices for *intermediate-* and *low-carbon ferromanganese* on the market of *Southeast Asia*, it is published only by *FACOM*, and by virtue of analyzed above reasons, they should be considered false.

Price information for ferrosilicon on the market of Southeast Asia is published by *Metal Expert* (China), *Metal Bulletin* (China), *CRU Bulk Ferrolloy Monitor* (Japan), *Metal Pages* (India); this information may be considered as rather reliable, excluding the data concerning China.

“*Metal Expert*” edition publishes information about prices for ferrosilicon *manganese and ferrosilicon* on the market of *Turkey*; data about price for *ferromanganese* of all types on the Turkish market is absent in all world information sources.

This edition “*Metal Expert*” publishes data about prices for manganese and silicinate ferroalloys on the Russian market. Incorrectness of prices for *ferrosilicon manganese*, which are



**Figure 6** Dynamics of prices (USD/mt) for high-carbon ferromanganese on the USA market in September-December 2013.

published by Chinese source *Asia Metal* on the terms of FOB,

Black Sea port of Russia, was analyzed above. The data about prices for *intermediate- and low-carbon ferromanganese* on the market of Russia is absent in all world information sources.

To analyze the data about level of costs during **export of Ukrainian ferroalloys on various markets** is of great interest.

According to analysis of information about prices for ferroalloys according to various world sources, the level of prices is given in respect with delivery of material before basis of publication. This price display takes into account some range of costs, which are borne by supplier while material realization from production plant of the basis on one or another market and may include railway tariff; shipping costs on the board; customs duty; customs clearance of cargoes; freight costs; delivery in stock (including storage and security); delivery from stock to the buyer; payment of auditor service; commission fee of trader; insurance charge; cost of financing; other costs.

During export in September- December, 2013 on the *EU* to end-consumers, spending level of Ukrainian suppliers made for ferrosilicon manganese – from 63 to 181 Euro/t, ferrosilicon – 93-242 Euro/t, high-carbon ferromanganese – 63-141Euro/t, metallic manganese – 274 Euro/t.

During the same period while export to end-consumers in *Turkey*, costs for ferrosilicon manganese made 90-225 UDS/t; ferrosilicon – 11-277 USD/t. During export of ferrosilicon manganese to *South Korea*, the costs made 180-303 USD/t and while export of the same alloy to Japan - 111-204 USD/t.

Difference in costs, in some cases very essential, is connected with shipment and

unloading of goods in various ports of various distances from the buyer, different freight conditions (type of ship, the year of launch, etc), various packing, different storage conditions and transport condition (for example, to dispatch goods on the return trip of empty vessel is usually cheaper than according to normal fare), etc.

The given above data about costs is typical also for other world markets, herein the specific numbers may be corrected depending on seasonal factor, changes on freight market, variation of prices for fuel and other global trends.

**Conclusions:** The data concerning situation on the world markets of manganese materials and ferroalloys in September-December 2013 is analyzed. The reliability of various sources, characterizing prices for specified products for EU, USA and Southeast Asia markets is estimated. The appropriate calculation methodology of price characteristics of Ukrainian manganese crude ore, considering the peculiarities of its material composition, is suggested. Cost data, connected with export of manganese ore and ferroalloys from Ukraine on different markets (EU, USA, Southeast Asia, Turkey) is systematized and analyzed.

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