THE COSTS OF THE ELECTRICAL ENERGY IN THE ALUMINIUM INDUSTRY

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The economic crisis has given the opportunity to reconsider the use of resources, so the subject of competitive advantage has become actual. In the aluminium industry the cost of electrical energy is critical not only for competitive reasons but for the mere existence and performance of numerous production facilities . Several ways of resisting the pressure of high energy costs have been experimented the most promising being those based on different forms of public-private partnership/co-operation. In many countries the big industrial producers benefit from a special treatment concerning the energy acquisition and are supported by the government in order to remain competitive.
Key words: energy, energy market, aluminium price
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1. Introduction

The expenses connected to the electrical energy represents the most important component of the aluminium production process. To the global level, in 2009, the electrical energy represented 36% of the aluminium production cost, 5 percents more than in 2008. Thus, the electrical energy represents the biggest part of the total costs followed by alumina -Al2O3 (by 34% of the costs in 2009). From now until 2015, it is foreseen that for the aluminium production the non-energetic costs will decrease and thus the rate of the energy cost in the aluminium production cost will increase.

2. Types of energy

The energy used in aluminium industry is produced mostly from coal (50%) and hydro energy (40%). During the last years the use of the hydro energy in aluminium industry decreased. For instance, in 2000, the hydro energy represented 54% of the energy used in aluminium industry compared to 40% in 2009. The percentage of the energy produced using the gas increased from 6% to 8% in the same period and that of the nuclear energy decreased from 5% to 2%.
The increase of the aluminium quantity ratio produced by using coal based energy and the decrease of the aluminium ratio produced by using hydro energy come mainly from the development of the Chinese market that generally use coal based energy. Since the Chinese aluminium production ratio will increase in the future, it is assumed that for the aluminium industry will be used more and more coal based energy. Furthermore, the increase ol aluminium production in the Middle East will lead to an increase of the gas based energy ratio.

3. The energy price

A characteristic of the energy market , in a liberalised context, is the rise of price volatility This volatility introduces additional costs for supply and presents many challenges for producers, consumers companies and policymakers. But the general trend in the energy price during the last years was a the rise.

The energy unit price increased by almost 110% from 2001 until 2008, from 18.8 USD / Mwh to 40 USD / MWh. In 2009 because of the global financial crisis the energy unit price decreased by almost 5% to the international lavel and after that increased to approx. 41 USD/MWh in 2010. The energy price in China is much more higher than in the rest of the world. This is why the above mentioned unit price was smaller if the China production would not be taken into consideration.

In 2009, the electrical energy for aluminium production was bought in medium by 32 USD / MWh that represents a decrease of 12% compared to the average from 2008 of 36.4 USD / MWh. To the international level the electrical energy price decreased in 2009 and 2011 because of the following reasons:

- The metals price decreased that led to a decrease of the energy price because the energy price established by the contract is connected to that of the metals (excepting China).
- During the last quarter of the year 2011, a lot of companies decreased their production, they decided not to start a part of their capacities stoped in 2009 or they even closed certain production activities. This is valid especially for the old installations that are less efficient and for which the energy was more expensive.
- The decrease registered to the electrical energy unit cost in 2009 would have been much more higher if it had not been taken into account the aluminium production from China where the energy is more expensive.

The energy tariffs connected to the aluminium price represented 36% of the total energy bought 2009 for aluminium production. These tariffs decreased by 32% from 2008 in 2009 from 31.2 USD/ MWh to 21.2 USD / MWh. Regarding the energy tariffs that are not connected to the metals price , these decreased from 38.5 USD / MWh in 2008 to 35.9 USD / MWh in 2009 that represents a diminution of 7%.

Before 2004 the production achieved from the bought energy represented 79-81% of the total aluminium production. After 2004 this ratio decreased considerably especially due to the increase of the aluminium quantity produced in China by using the own energy (from internal power plants).

It is estimated that (1) to the global level the percentage of the aluminium produced using the own energy increased to 40% in 2009 compared to 35% in 2008. After 1995 the quantity produced using the own energy increased in average by approx. 10%. According to Brook Hunt (1), in 2009 the average price of the own energy used to produce the aluminium was of 47 USD / MWh, by 2% more than in 2008.

Between 2009 and 2015, the electricity specific consumption is estimated (1) to decrease by 0.8% from 14.7 MWh / ton to 14.6 MWh / ton of aluminium. In 2009 it was estimated that (1) an increase of the energy costs will follow in 2010 and 2011 in order to decrease to approx. 596 USD / ton of aluminium in 2015.

Types of contracts

Also, there are many types of contracts that the aluminium producers have with the energy companies. The type of the contract influences both the energy tariff and its variation. Generally, there are three types of contracts:

a) Fixed price
b) Cost-plus
c) Partial or total increase compared to the aluminium price or compare to other parameters.

The fixed price contracts remains fixed in local currency (for instance in RON). The price of energy expressed in USD modifies when the local currency/USD exchange rate fluctuates.An exemple of fixed contract in USD is offered by Mozal company. A fixed tariff has the advantage that it offers to the producer a high certitude on the costs. .

When the energy supply contract is a cost-plus type the price paid by the energy producer varies like the energy production cost born by the energy producer. Thus, the energy price will depend on the fuel price (oil, gas, coal).Generally, this type of contract is not attractive for the aluminium producers because the variance in the energy production price may not corresponds with the variance in the aluminium price. In spite of all this it is possible that the energy price obtained by a such a contract to be , in average, smaller than the price obtained with a fixed tariff contract or a contract where the price depends on the LME. Examples of producers using cost-plus contracts are Warrick Alcoa in the SUA or partially in Portland from Australia.

There are many companies in which the energy acquisition price depends on the aluminium price. For the aluminium producer this type of contract has the advantage that the raw material price decreases when the aluminium price is low thus reducing the costs and assuring the production continuation. For the electricity producer this type of contract generally is a beneficial one. When the aluminium price is low the marginal price of the energy production is generally covered (usually by using an inferior limit of the energy selling price). When the aluminium price is high the electricity producer benefits from this fact. In spite of all this there were situations where the electricity producer suffered important losses when the aluminium price (and consequently the price of the sold energy) mentained to a lower level than the foreseen one.

Ussualy, in order to protect both the electricity producer and the aluminium producer a such an energy contract contains both an inferior and a superior limit. The inferior limit (floor) offers protection for the energy producer and the superior limit of the tariff protects the aluminium producer.

Generally, in the aluminium industry the contracts where the energy tariff is connected to the aluminium price are very diversified. The tariff type can vary from linear relations (for instance Hillside in South Africa) up to very complicated formulas (Portland in Australia) in which the limits (superior and inferior) can at their turn depend on the aluminium price or other idices like inflation or fuels price.

Brook Hunt estimates that in 1996, the contracts in which the energy tariff depends partially or totally on the aluminium price represented 35% of the total aluminium quantity produced. Accordingly (1) this ratio decreased along the time to approx. 21% in 2003. The decrease is due especially to the significant increase of the Chinese production during the last years, the Chinese producersnot using contracts where the energy tariff depends on the aluminium price. In 2009, the number of the producers buying energy at a tariff influenced by the metals price was of 28, one less than in 2008.

Table 1
Examples (according to CRU analysis (2)

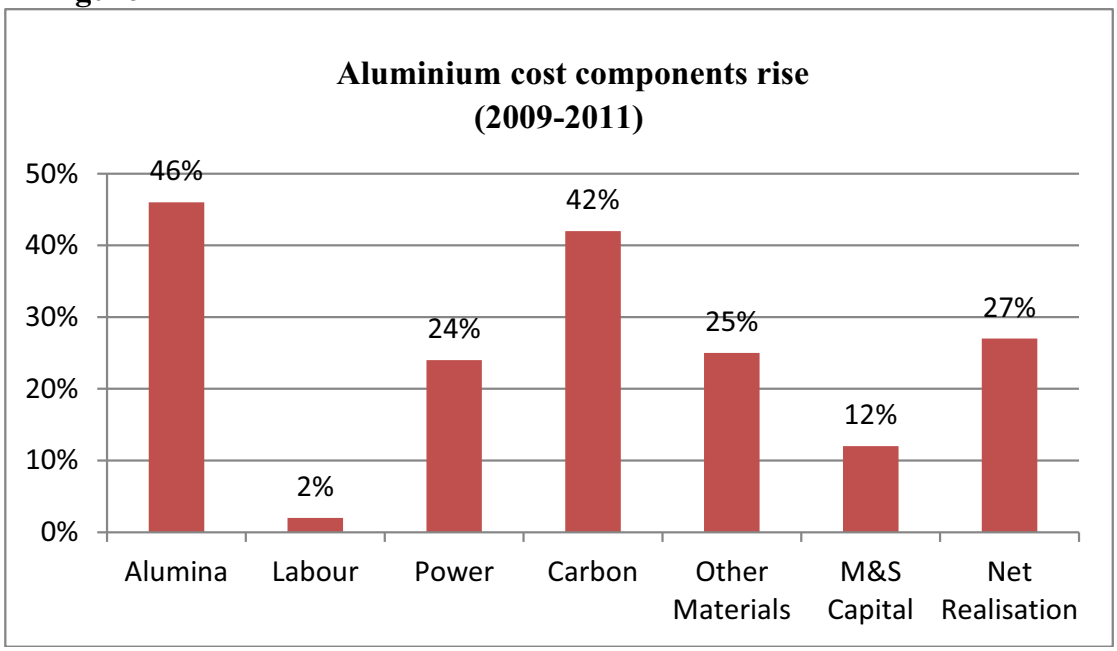
Producer	**Energy Cost in electrolysis ($/ton of metal)**
Alro, Romania	728*
Sunndal, Norsk Hydro, Norway	546
Mosjoen, Alcoa, Norway	645
KAP, Podgorica, Montenegro	764
St Jean de Maurienne, Rio Tinto Alcan, France	367
Bratsk, Russia	253
Irkutsk, Russia	239

*The energy costs at ALRO do not include the new taxes for the cogeneration tax and green energy .

These data are valid for the year 2010, when ALRO was accused that they bought the cheapest energy in Romania.

The table above represents different costs for a diversified aluminium producers sample. Out of the companies from this table higher tariffs for energy have the two energy producers in China and KAP plant (Muntnegru). The cheapest energy is that of the two plants from Russia followed by the one from France and than the two from Norwey.
Between 2009-2011 aluminium business costs increase from $1456/t to $2009/t. The rise of the components of the total business costs during that period is showen in Fig. 1

Figure 1



Source: Driscoll, Kelly (2011), Trends in the costs of production throughout the aluminium value chain, 15th ARABAL, Oman

Possible measures to support the aluminium industry

Implementation of a policy and coherent strategy in order to create a special treatment concerning the energy acquisition for all electrical energy band consumers (distinctly from the other industrial consumers and intermediate traders) whose prices to be differentiated depending on the level of the individual consumption and the capitalization degree of the energy.
Bonus granting for the consumers in band during the weekend and at night (it is known that there is a very reduced demand for the weekend and reduced during the night).
Opening of OPCOM market for the long-termcontracts (a compulsory condition for the drafting of the business plans on at least 5 years) otherwise development plans cannot be achieved for no company.

4. Conclusions

In many countries of Europe and from the world is normal that the big industrial producers to benefit of lower energy tariffs than the rest of the consumers. These big producers (as are for instance in Romania, Alro or Arcelor Mittal) need cheap energy in order to keep their costs down and in order to be able to compete on the international market. Consuming big quantities of energy it is normal that they to be able to negotiate lower tariffs.
At present the plus-value created by ALRO and Arcelor Mital assures directly or indirectly the existence of over 500 000 people. Consequently, it is very important that such kind of companies to be supported by the government in order to remain competitive.

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