



**Asia-Pacific  
Economic Cooperation**

**INTERNATIONAL WORKSHOP  
“IMPROVING ENERGY EFFICIENCY IN THE  
APEC MINING INDUSTRY”**

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Santiago Chile

**Debate and Synthesis Session**

## DEBATE AND SYNTHESIS SESSION

### INTERNATIONAL WORKSHOP

#### “IMPROVING ENERGY EFFICIENCY IN THE APEC MINING INDUSTRY”

The quality of the speeches, the variety of the topics developed along the Workshop and the level of the debate will, most probably, leave different seeds of learning inside the heads of the participants and these seeds will spring and grow up differently in each of them. Not with the idea of developing nor covering the topics in full nor within complex limits, we can make some general conclusions about the workshop or we can stand out issues to think of, among other issues, we can mention:

\* *the importance of the electricity consumption in the minerals grinding as well as the multiplicity of parameters that take part in it.* In this aspect, the improvements aim at making better the materials feeding, reducing the wearing down of the inner coverings of the grinding machines, making better the design of the semi-autogeneous “lifters”, minimize machine stoppings, optimize the size reductions, the products homogeneity and the mineral pulp flux. The simulations become central because the mills operation is similar to the operation of a “black box”.

\* *along with the above-mentioned ideas, it is important to stand out some general tendencies in the menace or threat.* The improvements aim at, among other objectives, increasing the speed, increasing the power, increasing the real production, making the granulometry better, reducing the maintenance, reducing the wearing down, making better the attack angles). An important part of the efforts made in this field are being made in existing mills.

\* *the comparison of the global results between the Semi-Autogenous Grinding (SAG) and the standard grinding.* The issue turned out to be controversial because the comparison between the specific consumptions for both kinds of grindings was not necessarily on favor of the former kind of grinding, namely SAG. However, the predictability would be higher in the SAG grinding machines –compared to the predictability in the standard grinding, if there was a change of design in both.

\* *the melting process, along with the transport, is the area that concentrates most of the energy consumption level in the copper mining.* The technological development aims, in the short run, at finding or devising Flash-like solutions, and in the long run, at the melting and continuous conversion (in this field, we work at the level of low scale pilot plants, which is the case of the working scenario of the different researches that are being carried out at the University of Chile). The above-mentioned idea should not led us to ignore the advantages that El Teniente Conveyor has.

\* *the mining companies are beginning to incorporate alternative fuels in the process of minerals melting because of the high prices that are being asked when you buy or purchase conventional fuels.* There are important efforts that are being made to make the efficiency better in the melting and converting processes as a whole (reduction of the solid or gas effluents to their minimum levels). Additionally, in the calcinations of the lime stone, for the production of the clinker and at the melting plants, people are beginning to consider the use of tires as fuels, the reused oils and others (depending on the local prices charged for the energy, in many countries, more or less 35% of the operation costs of a melting plant corresponds to the use of energy).

\* *we made analyses of certain cases in which, the study of the production costs from a systemic viewpoint, showed reductions in the consumption of natural gas down to 50%.* The moving of the mineral through using the cascade system (a mixture of theory and empiric evidence), the reduction in the size of the pieces of mineral placed into the oven, the reduction of the manganese crust, the increase of the temperature of the combustion air, the reduction in the number of production equipments by means of the change in the processing, were some of the measures taken as part of the strategy of energetic optimization of each stage of the process.

\* *the development of indicators carrying no energy efficiency is a topic which is particularly relevant.* We showed the results gotten from a systematic and detailed analysis of the pieces of information about the effective energy consumption in the mining industry in Chile (considering almost 100% of the universe of copper mining industries along Chile). It was said that this is an effort, which has no parallel in almost any other country around the world. Likewise, it was stood up how the Chilean Government used these pieces of data during the natural gas crises, which added an extra value to the effort that had been made.

\* *control over the processes is a central issue for the improvement of the efficiency in the use of the energy.* The discussion of this topic let us evaluate the replacement of existing equipments and machinery, optimize operations, to pinpoint or detect failures in the procedures in place, etc. Relevant examples of the application of the technology showed were the managing of the minerals grinding, letting us increase the production as well as reduce the use of energy almost 10%. During the debate, there was a doubt in relation to its applicability in the cases that the control and measuring instruments re not enough (which is the case at most of the industrial and mining plants) and the efficiency of the inferences you arrive at using "the observer" method, which was suggested by the speaker.

\* *A foresight of the mining industry not only in the economy-related aspects, but also in the social aspects of it.* The social responsibility of the mining industry was stood out in many opportunities along the workshop. Another principle for the future development on which there were many coincidences in opinion, was the need to safeguard the continuity of operations (which let us reduce significantly the energy consumption).

\* *¿is there going to be enough energy for the mining developments in the future?* The answer was a yes, the problem is going to be the price charged for it. It was very clear that the price tendency is towards the increase of it was also clear that the prices we are paying at present will be just a remembrance; for example, it was stated that, in South America, it is very difficult that Argentina or Bolivia keep the prices for the natural gas at US\$ 3,5 per a million of BTU, and the most probable scenario is that such price will increase twice just as it happens to the international price of it. Something similar should happen to oil prices. What has just been said should make us increase our efforts to make an efficient use of the energy and, therefore, there will be less air pollution. On the same discussion table, it was forecasted the closure or finishing of the copper concentrates melting plants, which was discussed and it was rebated later on.

\* *the concepts of efficiency right, mining environmental liabilities and the increase of the price of the energy due to sustainability reasons.* This issue follows the same line of thinking that was followed for the valuation of external factors, conceptual and practical emptiness to be solved because of their importance to the energy and environmental policy, despite the theoretical complexities it implies. Finally, and consistent to the above-mentioned ideas, it was said that the environmental sustainability of the mining exploitations must be paid by the users (most of whom are placed in the developed countries)

\* *the technological development and the future challenges in the mining industry.* The future challenges in the mining industry not only have to do with the energy, but also, with the fact that the law is out of force, making the resources more complex, making the mineral fields or mineral deposits deeper, the need to have available the human resources required and to make sure the sustainable development of the activity. In general terms, we integrate under the same perspective the business challenges as well as the technological challenges. Of special importance was the proposal in relation to the fact that the innovation is the most profitable investment. Such statement, being duly appreciated by the participants, had a counter statement, which stated that the investment on talented young students is even more profitable. Other option which is starting life in Chile, consists of the fact that Chile integrates internationally with companies of the mining sector, suppliers and excellency centers so as to make profitable and to speed up the process of innovation. In this case, the direct investment on I&D may show a tendency to the low, despite the recognition given to the profitability of this kind of investment.

\* *the reduction in materials transportation due to the impact of the energy on the costs constitutes a central goal of the I&D.* Along with that and in different time scenarios, the continuity of the operations constitutes another goal of the I&D, just like the bio-mining, the human development, the sustainability in its broadest sense and the market development (quality of products and new applications). Even the submarine exploration is beginning to be a high relevance topic.

\* *relevance of the biotechnologies in mining, in relation to the most conventional options.* It was stated that biotechnology opposes or goes against the permanence and development of the pyro-metallurgy, on the contrary, it goes along with it because they are complementary technologies (people stood out the advantages of the pyro-metallurgy in the recovery of copper and precious metals).

\* *the specific analysis of the use of the efficient energy use in China.* In China, energy efficiency is a need because of the constant “black outs” that strike the country because of the lack of capacity in the generation of energy and transmission lines, of the lack of coal, oil and electricity supplies, of the competitiveness of the industry (in the case of the steel industry, the energy represents the 25% of the cost), of the reduction in the pollution levels and of the sustainable development. Although the energetic intensity was lowered almost 4% a year during 20 years, there’s still along way to go yet. Due to the above-mentioned reasons, China is incorporating a mid-term plan, which aims at, among other objectives or goals, introducing energy efficiency laws, technological development, money incentives to lower the environmental impacts, paying attention to the supply safety, improvements in the way of designing the energetic policies, voluntary agreements, etc.

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