



No sooner said than done

The mining industry will be delighted with a completely new way of crushing the ore. The Managing Director of Micro Impact Mill Ltd., Parvis Gharagozlu, explain the background to the development of the Micro Impact Mill, which will improve both raw material productivity and protection. This innovation renders preliminary size reduction by crushing and milling unnecessary and does so in a very energy-efficient and environmentally-friendly way.

The Micro Impact Mill is an innovation with the potential to revolutionise the mining industry. Where did the dedication to develop this “ball mill without balls” come from?

Take a look at the mining industry: raw materials have been extracted in the same way for over 50 years. Nothing innovative has happened here and I have observed the Chilean copper production for decades now. Always just breaking up, crushing and grinding stones—a really hard business. That’s boring for a mechanical engineer. No innovation, no changes!

I’ve been involved in mining in Chile for 30 years. In this time, I haven’t met one person who has been concerned about health and the environment. In terms of my thoughts and my actions, I had reached the point where I wanted to do something about all of the dirt and noise and, at the same time, change mechanical engineering. I can no longer accept that my employees and friends should have to work in this environment. I was quite aware that the principles have stayed the same precisely because resources such as copper and noble earths are becoming increasingly important. Mining technology can’t just keep up with these fashionable terms, such as resource management and sustainable. No, it has to be one step ahead!

And that led to the development of the Micro Impact Mill?

No, the first ideas and trials with Micro Impact were already there at the start of the nineties. The development of the machine and its technical refinements took several years. Every mechanical engineer knows how much effort needs to be put in before a machine does what it’s supposed to do. I studied mechanical engineering in Germany and, as a result, functional safety and flawless construction have always been important to me. In the meantime, the Micro Impact Mill has undergone successful test stages and constant optimisations. Long-term tests have been taking place for months in Chile. Now the time is right to present this new and very efficient ore crushing technique to the public.



Where does the efficiency of the mill come from? What is the machine's technological secret?

It sounds so easy—the stones crush themselves. And that reduces the energy consumption dramatically. You just have to look at the jagged moon: the impact of numerous collisions with asteroids can be seen on the surface there. These large-scale impacts also affect the earth. With speeds of up to a maximum of 42 km/s total destruction would ensue. Material hits into material and the extremely high amounts of energy pulverise everything. What happens in nature can only be the right thing for mechanical engineering and cheap too. Regardless of whether it's a meteorite collision or the smallest ore stone, I have harnessed this natural phenomenon in order to carry out crushing mechanically.

In the Micro Impact Mill “raw power is exercised sensibly”. The stones' movement is accelerated, which means that, in accordance with chaos theory, they collide with each other multiple times. In the shortest time, the finest stone powder is produced. Completely different to the other crushers and mills, which need mechanical equipment and iron balls to do this. You have to imagine that the difference between crushing the ore with crushers and mills and using the Micro Impact Mill is comparable to some extent with the move from a prop airliner to a jet plane.

Is Germany the right place to be presenting this innovation at the trade fair? What is the motivating factor there?

Where else can you find such a well-developed innovation culture for mechanical engineering? Here there are hi-tech strategies and various initiatives for sustainability and energy-efficiency. Here there are industrial arenas where different sectors meet and discuss change, whether of a technology or business type.

It's vital for me to be aware of the activities and reaction of the market. An innovation has its justification when it works. The initial acceptance from mechanical engineers influences the results for the market or the environment. It's my aim to bring the Micro Impact Mill to trade fairs with international audiences in Germany.

And now you have to wait and see what's going to happen here? What are your goals for the Micro Impact Mill?

Look at it this way: for me this is the first step in showing the industry that sustainable mining is possible. I hope that business models and mechanical concepts will be discussed that relate to how we can use innovative crushing technology in mining. My experiences in copper extraction have also shown that you have to take more responsibility for the environment and not just for technology. Do you know how much energy is being wasted in the mining industry? Can you imagine how much noise and dust pollution today's ore crushing generates? Who knows how many



people are dying of silicosis? For kilometres around you can hear these enormous facilities and dangerous dust is obscuring your view. Exactly at this point, there are chances opening up for the Micro Impact Mill, which could be significant in terms of healthier mining.

In the meantime, the engineering principle behind the Micro Impact Mill has been patented. The energy potential with this machine is tremendous and that opens up the possibility of a revival of mining in Germany, for example.

When you present the Micro Impact Mill to the industry now, what information and facts about it do you include?

As prototypes of the machine existed first, I can only give the verified figures for this model. The drive of the Micro Impact Mill has a power value of 35 kW. Comparable data for a ball mill shows that its motor consumes several times more energy. A ball mill in my plant has an instruction from the manufacturer that its power value is 750 kW! With a quantity of ground stone of up to 55 t/h, the Micro Impact Mill demonstrates the lower value of around 40 t/h compared with the ball mill. In operation, the sound measurements with the Micro Impact Mill have a value of 80 dB, whereas 130 dB is the norm for crushers. But it is the energy consumption of both during processing which is decisive. The Micro Impact Mill needs around three quarters less energy than a comparable ball mill!

All measurements in each case were carried out on a prototype of the Micro Impact Mill. What needed to be taken into account were the operating costs of the machine. A ball mill requires the regular replacing of its grinding element and the iron balls cost around US\$ 800/ ton according to the size and its procurement. That drives the costs up, but with the Micro Impact Mill these costs wouldn't arise.

Having said that, the Micro Impact Mill has clear procedural advantages for dry and wet processes. Plus there's the fact that this machine can treat stone and slag. Even bricks from a furnace don't cause it any problems. In terms of performance scope, the Micro Impact Mill can replace an entire process chain consisting of several crushers and ball mills.

The piloting of the machine is very important for me. The principle of micro-impact is the focus. The size and the design of the machine are adaptable. Granule size measurements from Fotec in Vienna have documented a granule size of up to 100 µm in diameter several seconds after it started operating, which can even be refined to 10 µm with an additional drive system. Further expert reviews are still under preparation at the moment. Two more machines are currently being assembled. Both constructions will shortly be going into production and providing evidence that ore crushing with the Micro Impact effect works efficiently.



And you're saying that this machine can replace a whole chain of crushers, conveyor belts and ball mills?

Based on the results, the answer is a clear yes. A lot more important are the roles of man and the machine. Everyone has the right to do good work that will challenge and fulfil them, but the conditions aren't right and the environment endangers their lives, so you have to deal with this situation and change something—even if it is after fifty years! Affordable raw materials for industry remain a fixed building block for the future of industry and the Micro Impact Mill is a modern possibility for bringing man, the environment and technology back into balance with another. The fact that this innovation just works in a cost-effective and efficient way should definitely provoke investment in it.

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