



I-PULSE
HighPowerSystems



**POWER GREAT
IDEAS**

I-PULSE IS THE WORLD'S LEADING
HIGH PULSED POWER COMPANY

Our proprietary technologies convert small amounts of electrical energy into limitless power to address a broad and growing suite of applications across multiple end markets. Our technologies are proven, cost-effective, efficient and green.

**Transforming, improving, discovering,
imagining.**

We prove that everything is possible
when you power great ideas.



HPP COMMINATION A DESIGN FOR DISRUPTION IN MINING

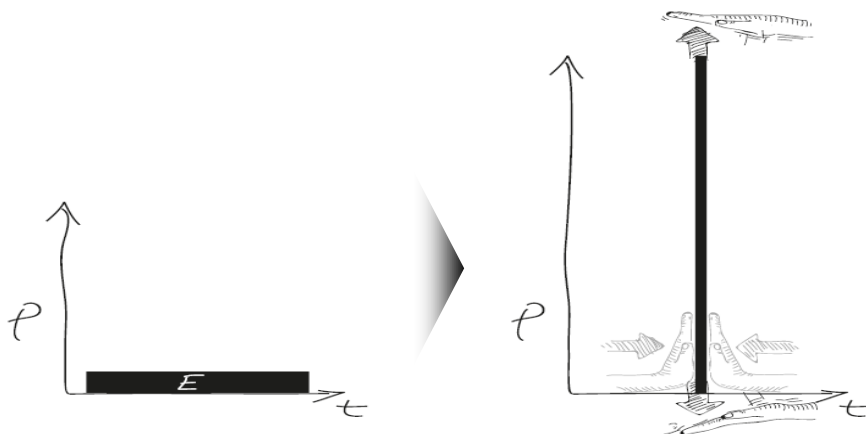
Laurent Frescaline CEO / Gilles Avrillaud CTO

WMF - June 2021



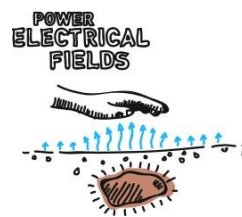
Pulse Power: The proprietary technology behind our business

What is Pulse Power ?

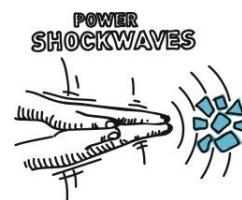


- Storage of small quantities of electrical energy at high voltage + rapid discharge = extremely high power
 - *Power output of a nuclear power reactor for less than a millionth of a second*
 - *Generating physical phenomena in materials that are unachievable with power levels of conventional technologies*
- Technology originally developed for defense applications in France by a company led by **Laurent Frescaline**, the founder and CEO of I-Pulse

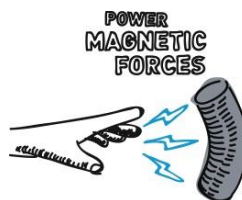
What are the I-Pulse applications ?



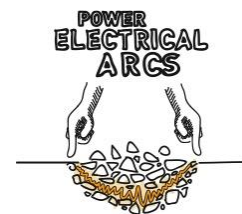
Large high power electrical fields can **reveal from the surface the presence of mineral or water resources** at incredible depths



High power shockwaves can be harnessed to **break apart rocks** or to **reconnect oil wells to reservoirs** by removing blockages



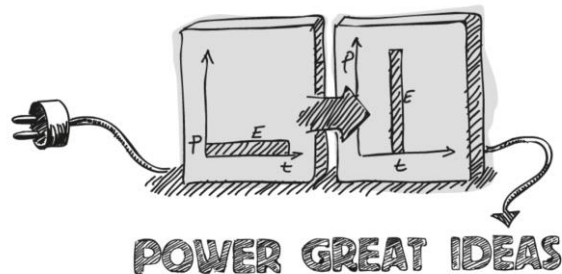
Powerful magnetic fields are used to displace metals at extremely high speeds, enabling **new forming and welding applications by impact**



Powerful electrical discharges are able to **disaggregate rock** and **rapidly penetrate extremely hard geomaterials** for drilling or tunneling



Pulsed Power Technology



Who We Are

- **Global leader** in developing innovative commercial applications for **pulsed power** technologies
- **Proven technological expertise** valued by blue-chip customers and partners
- Management team and Board assembled from highly **respected industry leaders**
- **~700 employees** across **ten locations** in **seven countries**
- **R&D center** located in Toulouse, France



Energy efficient rock crushing

*Ultrashort electrical pulses can **efficiently fragment rock down to small particles** using very small amounts of energy.*

The stakes

14 %

of electricity in **Australia** is
used to crush rocks.

4 %

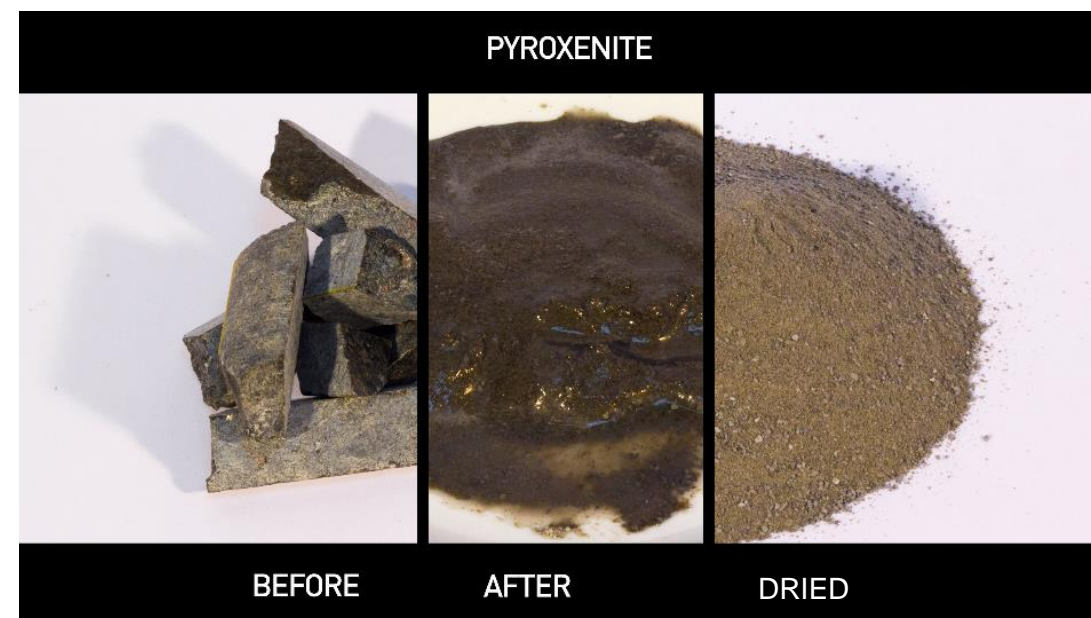
of electricity in **the world** is
used to crush rocks.





The Pulsed Power crushing disruption

TOWARD DRASTIC REDUCTIONS
OF ENERGY REQUIREMENTS
TO CRUSH ORES



Pulsed Power Crushing overcomes the limitations of conventional crushing techniques

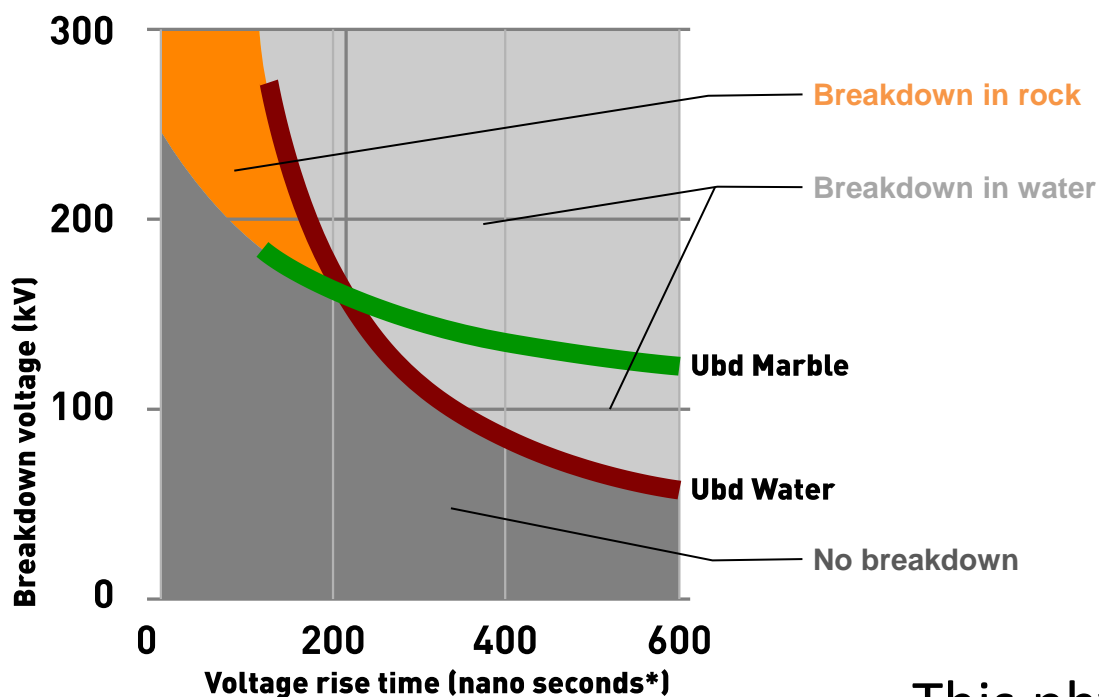
- Energy efficient due to direct tensile stresses generated at grain boundaries
- Adjustable parameters can be tuned depending on ore types (voltage, energy)
- Improved mineral recovery rates due to increased surface exposure of ores or avoidance of sub-fragmentation of gemstones



How does it work?

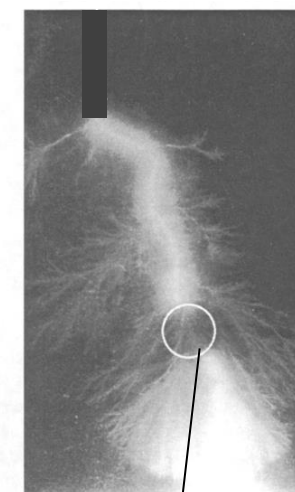
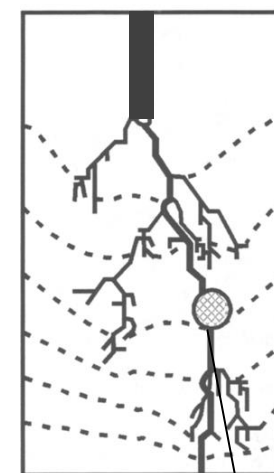
Physics of arc in a rock

If the voltage rises fast enough, breakdown occurs in the rock rather than in water



The breakdown occurs preferably at defect locations, meaning at grains and mineral boundaries

The Discharge trajectory is influenced by conducting inclusions



Metallic inclusion

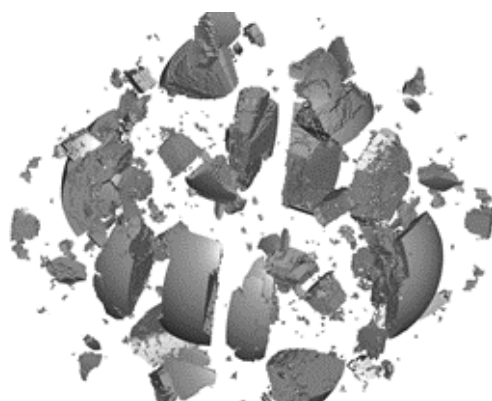
This physical principle tends to increase surface exposure for downstream processes and has proven it can generate several times higher grade of concentrate than with conventional mills.



Potential energy savings

Taking into account mechanical this stress type, rock behavior at high strain rate, number of generated fragments and energy losses, we came across that ***HPP crushers have the potential to require over 10x less energy than conventional crushers***

Dynamic loading simulation

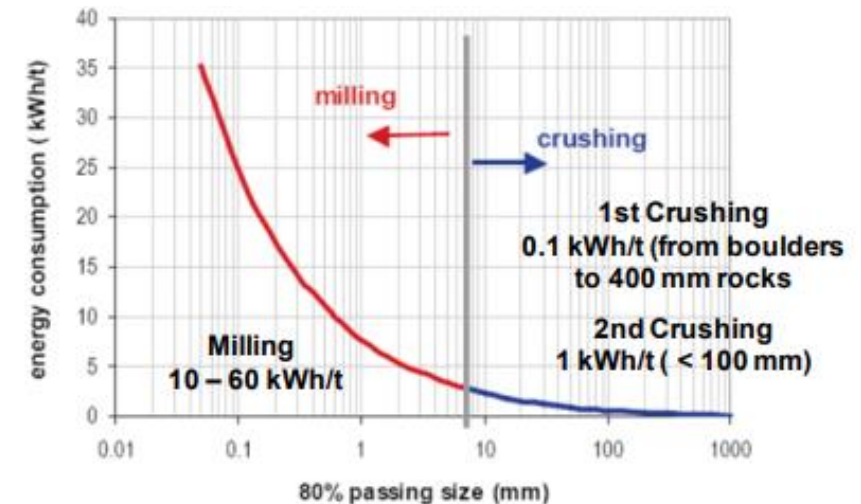


I-Pulse first target in crushing

I-Pulse plan on developing and delivering first low tonnage industrial prototypes over the next 3 years, **with a higher tonnage market introduction by 2026.**

As the energy requirement increases exponentially with reduced grain size, we are going to focus on **copper ores first**, in order to:

- Apply the technology to the market with the highest greenhouse gas emission footprint
- Address the increased copper demand driven by the energy transition (*) despite the foreseen declining ore grades



(*) The demand for copper is foreseen to grow from 20Mt/y in 2020 to 29-35Mt/y by 2030



Time has come to change the relation between economics and CO₂ emissions for mines

*A unique group
with a vision*

*A disruptive
technology*

*A unique market with
large opportunities*