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INTRODUCTION

VDB CIRCULAR ENGINEERING



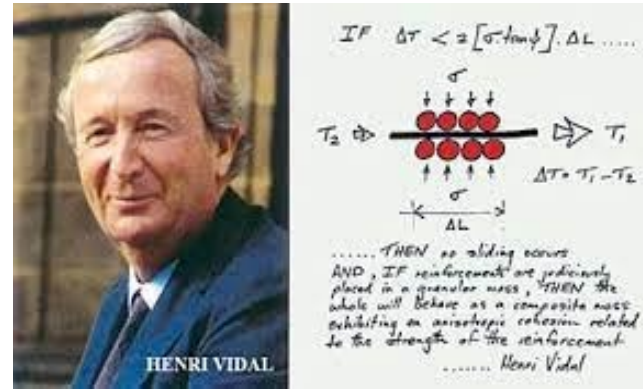
FRENCH INVENTORS IN THE 20TH CENTURY



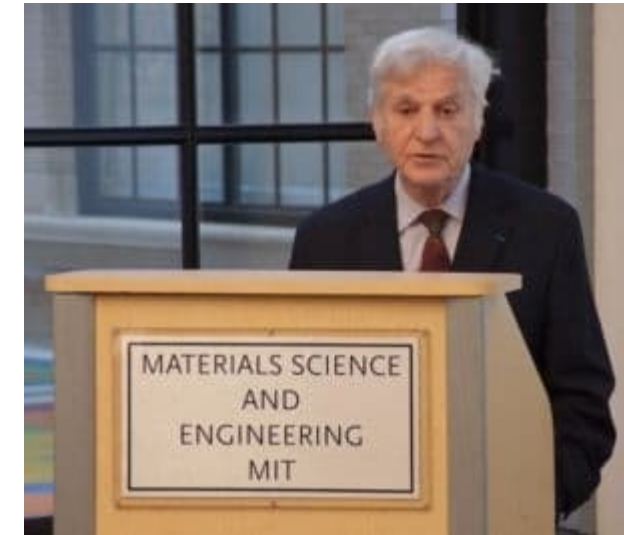
LOUIS MENARD –
PRESSIOMETER
AND DYNAMIC
COMPACTION



EUGENE FREYSSINET -
POSTENTION OF CONCRETE



HENRI VIDAL –
REINFORCED EARTH
WALL SYSTEMS



JOSEPH DAVIDOVITS –
GEOPOLYMER TECHNOLOGY

MODULAR CONCRETE EXPERT



- Civil Engineer / Dutch / 5 lenguajes.
- More than 1.300 Projects studied.
- 33 years of Professional experience.
- Concrete Precast Specialist.
- 4 years leading VDB Circular Engineering.
- 240 projects executed in 10 countries such as Belgium, the Netherlands, Luxembourg, Germany, Poland, Hungary, the United Arab Emirates, Peru, Colombia and Chile.

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ACTIVE PARTICIPANTS IN TRANSFORMING CHILE TO A CIRCULAR ECONOMY



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POLÍTICA
NACIONAL
MINERA
2050



OUR CLIENTS



CODELCO

BHP



COPEC



COPEC®

VOLTEX



OUR **STRENGTHS**

- A company of experts throughout the **value chain**



SUPPLY CHAIN PARTICIPATING IN MODULAR PROJECTS WITH PREFABRICATED CONCRETE ELEMENTS

INNOVATION PROJECTS: DEVELOPMENT OF PRECAST MINING PAVEMENT, CODELCO

ACHIEVEMENTS

- Slab design for high intensity mining traffic conditions and resistance to wear and create energy dissipation.
- It incorporates a self-leveling system for its installation.
- Eliminate construction waste in the mine.
- Allows the incorporation of mine tailings to make building materials for mine tunnel construction activities.
- Important CAPEX reduction in mining.



INNOVATION PROJECTS: PRECAST TUNNEL FORTIFICATIONS T, CODELCO

ACHIEVEMENTS

- VDBIC carried out a design that reduces assembly times by 50%.
- Improve deformation response and improve structural capacity.
- Allows the use of crushed tunnel rock and tailing as construction materials.
- Reduction of carbon footprint since it allows reusing material available in mining activities.
- Improves safety in underground mining works by working with 50% less construction workers.



WE GOING TO PRODUCE PRECAST INDUSTRIAL PAVEMENT ELEMENTS

ACHIEVEMENTS

- Carbon footprint reduction and direct benefits in environmental issues.
- Improving the safety of construction personnel on site by reducing the installation teams.
- CAPEX reduction in investments in concrete civil works.
- Ergonomically improvements for the assembly work on site, with less manual labor compared to brick pavements.
- Elimination of maintenance costs.
- Reuse in other areas for more than one cycle of use.





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CHALLENGES IN CHILE

VDB CIRCULAR ENGINEERING



SPECIAL CHARACTERISTICS OF CHILE FOR THE DEVELOPMENT OF INNOVATIVE NEW PROJECTS.



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- Extreme geography, it is common to develop projects in inhospitable conditions, such as high mountains (3.000 to 4.500 m.a.s.l. and deserts).
- Due to its diverse geography, all the mining and astronomy projects that are developed are different.
- All projects are developed with advanced structural engineering in order to be seismic resistant. Approximately every 20 to 25 years the country is hit by earthquakes over 8 degrees Richter.
- It is common to develop projects from all disciplines with local professionals given the complexity and uniqueness of the Chilean reality.
- One of the main economic activities is the mining of various minerals as gold, silver, copper, cobalt, iron, lithium, which is why the projects that are developed are large and multidisciplinary.
- **Chile still remains the largest copper producer in the world.**



ENVIRONMENTAL IMPACT OF 730 TAILING LAKES.

- Mining industry leaves 98 % of its crushed and milled rock behind.
- 450.000.000 m³/year create huge structures of fine materials.
- During next 25 years the amount of copper and lithium must increase 10 times to meet the worldwide electrical transition. Durable energy is not that durable for Chile.




OUR PROPOSAL FOR 2023-2026

Geopolymer Concrete

Precast Pavements

Huge Tailings in Chile



Science

- System discovered by Joseph Davidovits
- It is an artificial recreation of "rock".

Advances

- Successful results at the level of laboratory tests.
- Small scale pilot tests.

Composition

- Scientific studies must be carried out for each type of material.
- Inorganic aluminosilicates in alkaline medium



Precast System

- System Used in Europe since the middle of the 20th century.
- It's used for pavements

Doesn't exist in Chile

- The new system must be introduced

Composition

- Made from traditional concrete



Large amount of material

- Over 600 thousand cubic meters per day
- Increasing due to more need for copper.
- Most of them contain Aluminosilicates

Today it is considered Waste

- Technologies for reuse should be promoted
- It is possible to generate new green industries

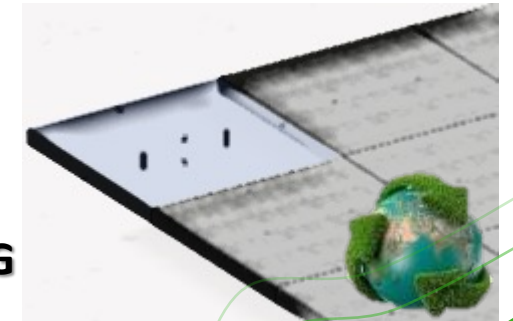
Environment

- Great environmental impact due to accumulation of tailings
- Reuse will promote technically more sustainable mining.



Innovation and Development with Circular Economy

RENEWABLE PRECAST PANELS IN GEOPOLYMER CONCRETE FROM MINING TAILINGS FOR CIVIL WORKS USING CIRCULAR ECONOMY CONCEPTS



OUR PROPOSAL FOR 2023-2026

Precursor material in producing geopolymer



<https://fundacion-cuyum.wixsite.com/domos-san-juan/geopolimeros>



<https://revistaanova.wixsite.com/anova/copia-de-sistema-de-aprovechamiento>



To create geopolymer concrete on an industrial scale using mine tailings as raw material



VDB NOTABLE **STRATEGIC FACTORS**



Experts in industrialization of all types of concrete.



Experience in concrete structural design.



Support of experts in tailings and laboratories.



Experience in managing multidisciplinary teams



Remote and field work has been done on the topic.



Drivers of use of BIM and LEAN systems in mining





**THANK YOU FOR
YOUR ATTENTION**



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