
CLOSING THE LOOP

High-Alumina Refractory Recycling
for the Mexican Glass Industry



GLORIA OSBELIA LEON ALVAREZ

Chemical Engineer

ESIQIE-IPN, Class of 1964



THE BEGINNING OF A JOURNEY

From academic training to real-world experience, laying the foundation for a lifelong commitment to industry and innovation.



AP GREEN: TECHNICAL GROWTH

1969 – EARLY 1970s



Advanced training in crystallography and X-ray analysis.



Collaboration with UNAM researchers and technical specialists.



Technical support for Mexican industries, including **Vitro float glass** operations.



Laboratory leadership and materials research.



UNAM

Technical collaboration with researchers and specialists.



A SUPPLY CRISIS BECOMES AN OPPORTUNITY



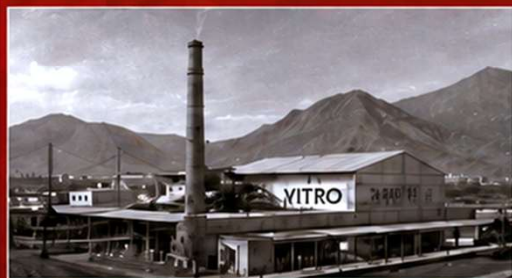
During the late 1970s, Mexico's glass industry faced supply limitations for specialized refractory components.



Technical experience in materials analysis and industrial testing enabled the local development of **refractory orifice rings**, later expanding into **other specialized refractory expendables** for the glass industry.



Early collaboration with **Vidriera México** marked the beginning of Refractarios Especiales León.



VITRO

A visionary company driving the development of high-performance solutions in Mexico.



The beginning of REFRACTARIOS ESPECIALES LEON

1979

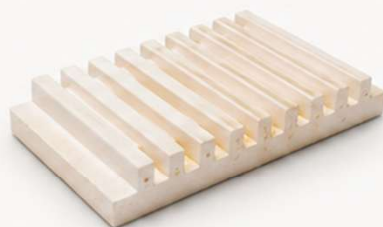
Technical developments in refractory materials led to the production of specialized laboratory accessories and refractory orifice rings for the Mexican glass industry.



Industry relationships through **CANACINTRA** and technical networks helped open new markets across Mexico.



Demand rapidly exceeded the initial production capacity.



CERAMIC HEATING
ELEMENT HOLDERS



REFRACTORY
ORIFICE RING

FIRST OFFICIAL INVOICE

May 29, 1979

REFRACTARIOS ESPECIALES LEON
DOMINGA ALVAREZ VARGAS
RSG.-FED. CAUS: MVD-000727

Carr. PedeDango de Ope. Manza. 8 Lote 646 Atinapán de Zaragoza Edo. de Méx.

VENIDDO A: PORCELANITES, S.A. Calle del Vidrio No. 8 Sta. Clara Edo. de México		FACTURA 001	
ENTREGAR EN	CONDICIONES	DIA 29	MES MAYO
		AÑO 1979	
		PEDIDO No. 354	AGENTE

CANTIDAD	DESCRIPCION	PRECIO	IMPORTE
10	JUGGOS - BLOQUES PARA QUEMADORES PARA EL HORNO DE BISCOCHO SEGUN ESPECIFICACIONES DEL PLANO "POPPI" S.P.A. POSICION 27a No. dib. 119-03 o/s.	\$ 1,750.00	17,500.00
26	JUGGOS - BLOQUES DE QUEMADORES PARA EL HORNO DE ES-MALTES 80 mte. SEGUN ESPECIFICACIONES DEL PLANO "PO-PI" S.P.A. POSICION 27 No. dib. 117-03 o/s.	\$ 2,250.00	58,500.00
16	JUGGOS - BLOQUES DE QUEMADOR PARA EL HORNO DE BIS-COCHO SEGUN ESPECIFICACIONES DEL PLANO "POPPI" S.P. A. POSICION 27b No. dib. 113-03 o/s.	\$ 6,950.00	111,200.00
38	JUGGOS - BLOQUES DE QUEMADORES PARA EL HORNO DE ES-MALTES 80 mte. SEGUN ESPECIFICACIONES DEL PLANO "PO-PI" S.P.A. POSICION 27 No. dib. 119-03 o/s.	\$ 1,750.00	66,500.00
COPIA			
Nú 4 \$ I.S.I.....			10,148.00
DOSCIENTOS SESENTA Y TRES MIL OCHOCIENTOS CUARENTA Y OCHO PESOS			263,848.00
DEBEMOS Y PAGARE[MOS] INCONDICIONALMENTE ESTA FACTURA PAGARE A LA ORDEN DE LA CANTIDAD DE \$ VALOR RECIBIDO A MI ENTERA SATISFACCION		TOTAL	263,848.00

FIRMA DE CONFORMIDAD _____ NOMBRE LEGIBLE _____ F-233



CANACINTRA
LA FUERZA DE LA INDUSTRIA



TECHNICAL EVOLUTION THROUGH COLLABORATION

Research, academic and industrial collaboration helped shape LEON's technical development during the 1980s and 1990s.



FLEXIBILITY

Custom refractory formulations



INDUSTRY

Growth across the Mexican glass industry



ACADEMIC COLLABORATION

Strategic technical collaboration



FROM TRADITIONAL RECYCLING TO CLOSED-LOOP THINKING

1980s–2010s



TRADITIONAL REFRACTORY RECYCLING

- Fired refractory scrap was commonly redirected into lower-grade products.
- Typical applications included secondary bricks, castables and industrial fillers.
- LEON initially followed the same industry approach.



SECONDARY BRICKS



LOW-GRADE CASTABLES



INDUSTRIAL FILLERS



THE NEXT CHALLENGE

- LEON later explored process modifications to reincorporate non-conforming raw materials back into production.
- Adjustments in suspension systems and additives enabled a new stage of closed-loop manufacturing.
- The result was the internal recovery of raw refractory materials within the same production cycle.



NON-CONFORMING RAW MATERIAL



RECOVERED RAW MATERIAL (SLURRY)



SAME QUALITY FINAL PRODUCT



But the most important transformation was **still ahead**.



A CRISIS ACCELERATED THE NEXT BREAKTHROUGH

During the COVID-19 pandemic, global supply chains became uncertain for the glass industry.



LEON accelerated research focused on **high-performance refractory recovery**.



The objective was no longer secondary recycling, but **preserving technical value** in advanced refractory components.



A specialized reprocessing technology was developed to recover **100%** of the fired refractory returns, with **zero material loss**.



Pilot-scale trials began for the reuse of fired refractory returns in **critical glass contact applications**.

*Not downcycling.
Technical recovery.*

SPECIALIZED MILLING
TOTAL MATERIAL UTILIZATION



HIGH-PERFORMANCE
GLASS CONTACT
REFRACTORIES

ORIFICE RING / BUSHING

PILOT SCALE. REAL CAPACITY. REAL PROGRESS.

Our pilot-scale milling plant is already operating, transforming refractory returns into high-performance solutions.



PILOT PLANT READY

- * Adequacy of the material
- * Specialized crushing and milling
- * Removal of contaminants



CURRENT CAPACITY

400
kg/week

of clean, optimized material



MAXIMUM POTENTIAL (FUTURE)

120+

orifice rings/week

Subject to laboratory and field validation.



We are in the testing phase.

Extensive laboratory and field tests are still required to reach our maximum potential.

Not downcycling. Technical recovery.



This is an advance.

Our capacity will evolve as we continue to validate, learn and improve.



THANK YOU.

“ To venture as an entrepreneur and pursue continuous growth, I have reflected on my journey and recognized the importance of the values that help move our industry forward.”

”

With resilience, continuous learning and long-term vision, we continue transforming experience into innovation.

Not downcycling. Technical recovery.

