CO_2 ABATEMENT, A SUCCESS STORY

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SUMMARY

- Present Chanlenges Faced by Cement Industry
- Clinker Factor Improvement : Existing and Proven Solution
- Supplementary Cementing Materials
- FCB Illustration in Philippine: TERESA PLANT
- FCB HOROMILL® Grinding Plant
- FCB Horomill® cement quality achieved results from industrial sites
- Conclusion: Key benefits obtained

PRESENT CHALLENGES FACED BY CEMENT INDUSTRY

Roadmap for Carbon reduction could be achieved to achieve zero net emissions by 2050 is building up pressure on Cement Industry to reduce its CO_2 Footprint

Different Strategies are considered:

- Switching to Fuels that are less Carbon Intensive (such Alternative Fuels)
- Implementing emerging and innovative technologies such as Carbon Capture
- Reducing Clinker to Cement Ratio (Or increasing Cement to Clinker Ratio)

CLINKER FACTOR IMPROVEMENT: EXISTING & PROVEN SOLUTION

- **CARBON CAPTURE & STORAGE (CCS) TECHNOLOGIES:** Extremely expensive installations, **Requires:** high CAPEX, Space, and most of all existence of Carbon Ecosystem for handeling the captured CO_2 at the Cement plant outlet

- **CLINKER FACTOR IMPROVEMENT:** Readily Available and Feasible Solutions. No Extra Cost and large impact on reducing the CO_2 emission.

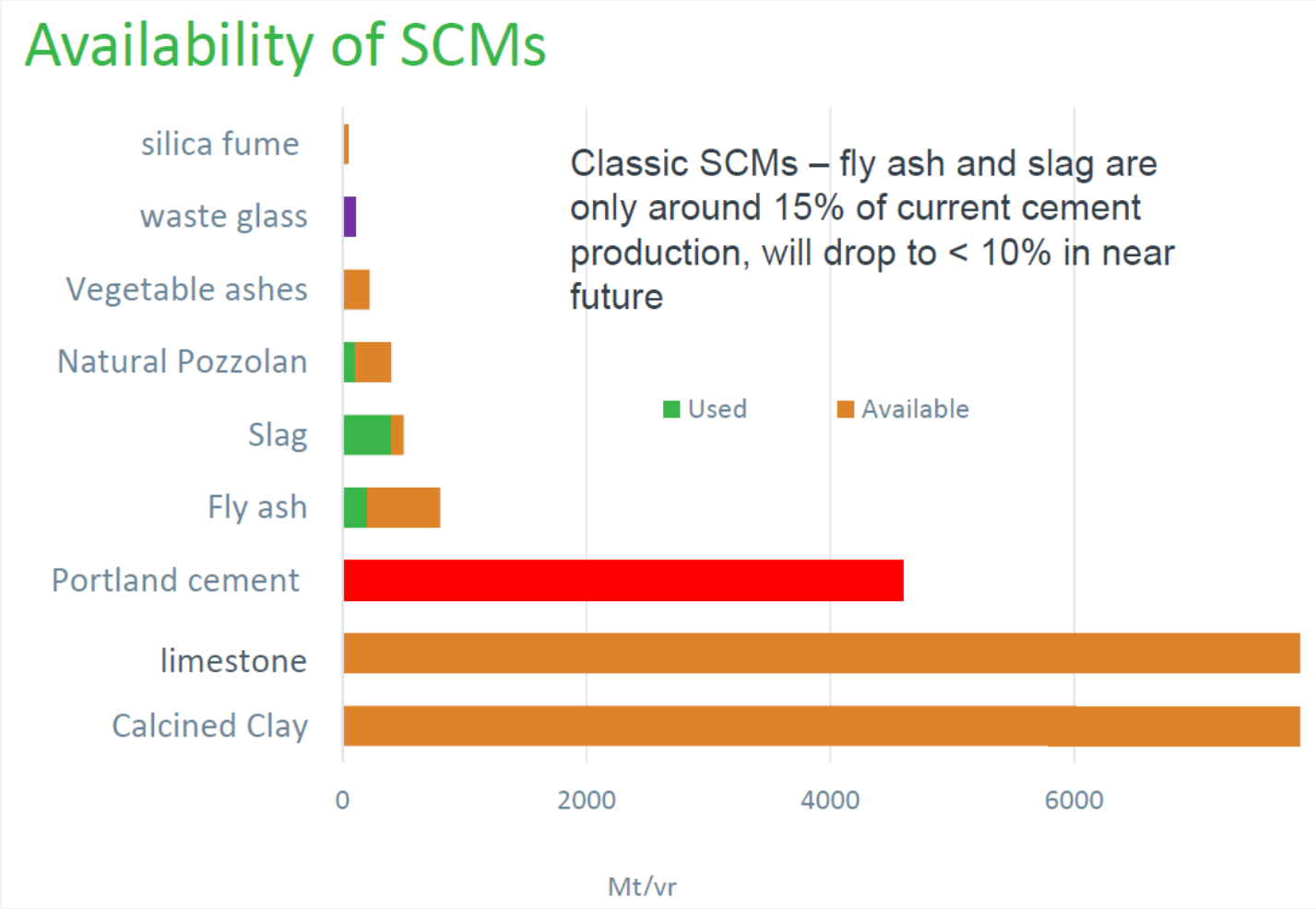
Some countries have already moved to Cement Production with high Clinker Substitution Factor (especially in Asia) whereas others are more and more increasing the amount of alternative cementitious materials and switching to Blended Cement thanks to National Standards evolutions.

Examples:

-In Europe: LC3 with the Clinker Substitution by Calcined Clay

-In the US: PLC (type 1L Cement) with increased additives

SUPPLEMENTARY CEMENTING MATERIALS



Source: *LC3: "A breakthrough technology to reduce CO_2 emissions from cementitious materials", Karen Scrivener, 2018*

FCB ILLUSTRATION IN THE PHILIPPINES: TERESA PLANT

Adapting to the market

The selection of suitable grinding systems is an important part of ensuring the competitiveness of a cement producer and its ability to rapidly respond to market requirements. This article examines some of the key requirements of such grinding equipment and shows how the FCB Horomill® can meet such needs.

■ by ***Fives FCB,*** *France*

Grinding equipment must be able to provide the cement producer with the right product at the right time, in volumes required by the cement market. In today's fast-developing markets, the ability to switch between the production of different types of cement becomes an issue of market competitiveness.

Continuity of delivery of much-demanded cement types as well as the ability to supply smaller market segments is helped by the correct selection of grinding equipment.

This includes cement plants producing cements with low clinker factors, therefore reducing carbon footprint and production costs in one go. The ability to efficiently grind additives such as pozzolana, limestone or fly ash is also important, but due to their higher moisture content, the grinding operation is often carried out in tandem with a drying arrangement.

Fives FCB supplied the Teresa grinding plant in the Philippines to Republic Cement

International Cement Review_January 2017

CONTEXT:

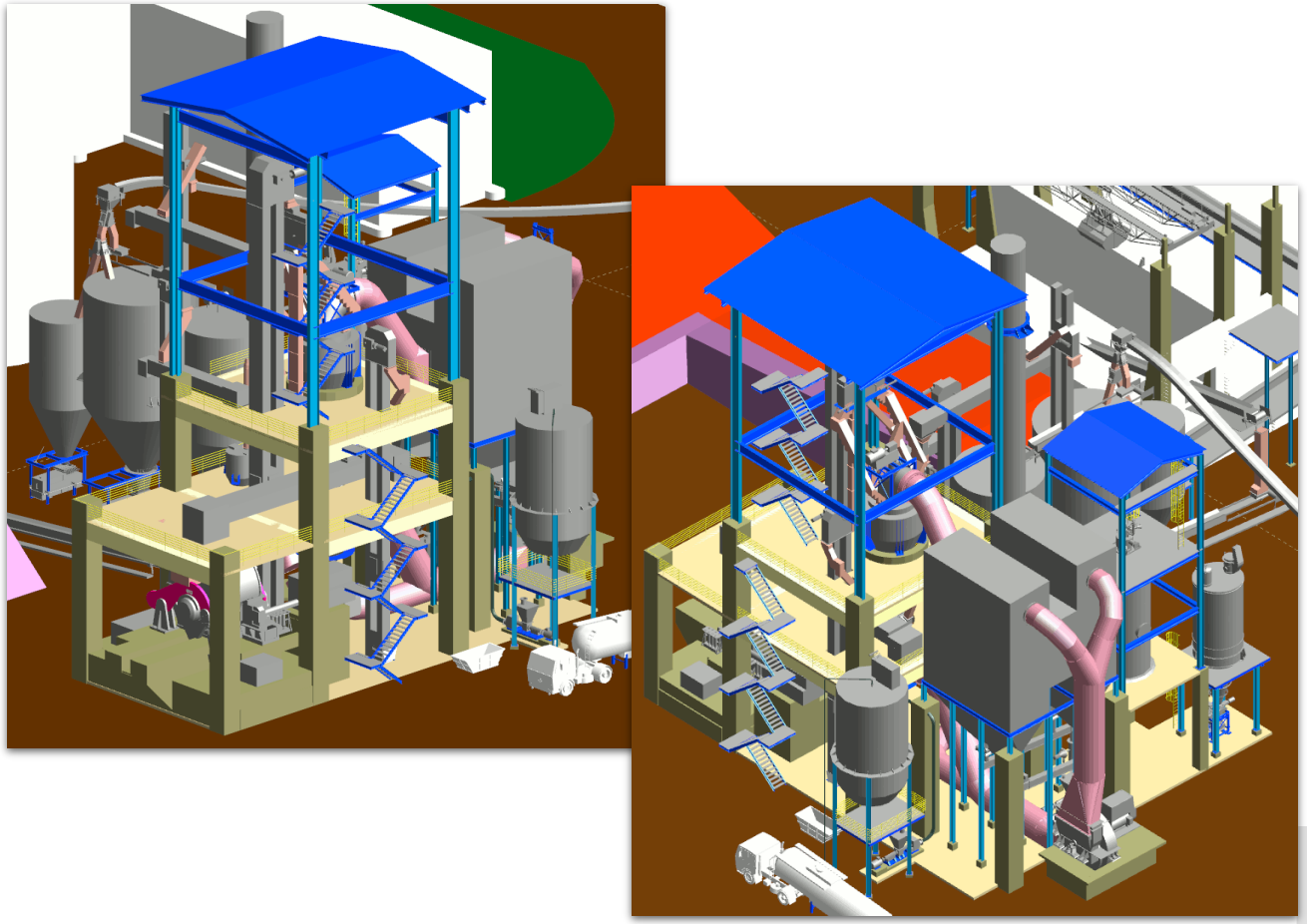
- **Strong market growth**
- **Client Expectation (Lafarge) :** Increased cement production by increasing c/k ratio only, keeping burning lines unchanged.
- **Targeted c/k** ratio from existing 1.38 to **1.8** by producing **1P grade Cement**
- **1P Grade Cement** (55% clinker only, 5% gypsum, 5%limestone, 6% flay ash, and **29% pouzzolan with** a high **moisture up to 25%.**
- Existing installation unsuitable for such new cement types production due to **moisture issues.**

FCB ILLUSTRATION IN THE PHILIPPINES: TERESA PLANT

SOLUTION SELECTED : FCB HOROMILL® INSTALLATION

- **Co-grinding of the 1P type cement. (c/k ratio 1.8)**
- **Handling and drying high moisture content in additives (Pozzolana up to 25%)**
- **Keeping Production of Conventional Cement** (OPC cement and Masonry cement)

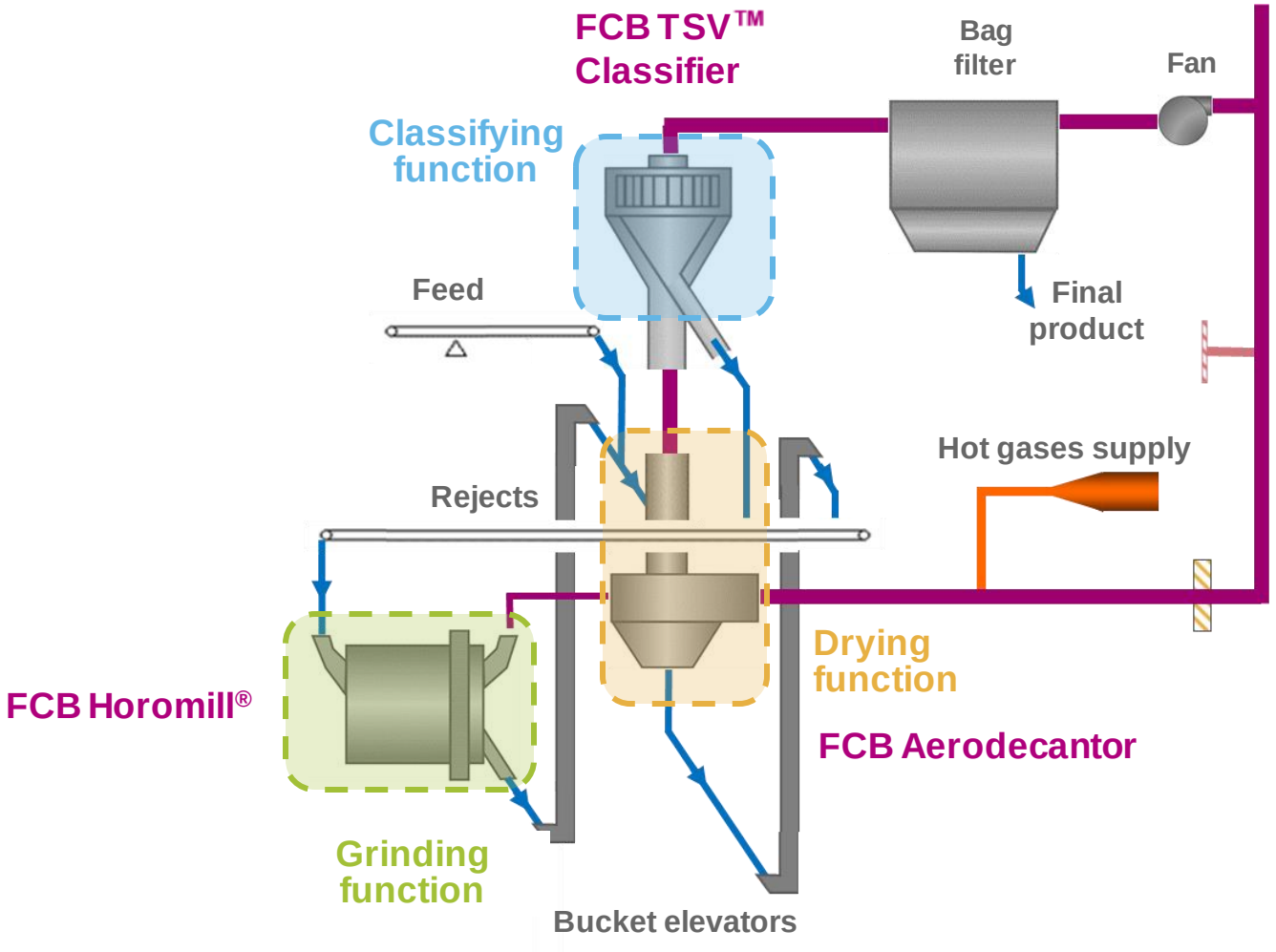
➔very good market response to the cement quality: **Repeat Order for Norzagaray plant.**



FCB HOROMILL® GRINDING PLANT

All **grinding, drying** and **classifying functions** within a **very compact workshop**

FCB HOROMILL® WORKSHOP: FLOW-SHEET



- → Perfect layout for separate drying centers or modular plants
- → Adapted for high moisture content feed product, clinker with high content of fines or from various sources
- → Adapted for ultrafine grinding

FCB HOROMILL® CEMENT QUALITY ACHIEVED RESULTS FROM INDUSTRIAL SITES (BLAINE AND REJECTS)

Performance tests results

High C/K ratios

Grade 52,5 cements

Plants		NORZAGARAY		TERESA		TULA		Europe		
Mill		HRM		HRM		HRM	Ball mill	HRM		
National Standard		PNS (equiv. ASTM)				NMX (equiv. ASTM)		EN		
Type of cement		1P		1P	OPC	CPC 30		CEM I 52,5R	CEM I 52,5R	CEM III B
	equivalent EN 197-1	CEM IV/B-P		*CEM IV/B-P*	*CEM I*	CEM II/B-P		""	""	""
		mai-16	mai-16	juil-15	juil-15	nov-17	nov-17	2012	oct-06	1999-2003
Composition	Clinker %	54,3%	50,8%	55,6%	91,9%	68,6%	68,6%	91,4%	~ *91%*	23,0%
	C/K ratio	**1,84**	**1,97**	**1,80**	1,09	**1,46**	**1,46**	**1,09**		**4,35**
Quality	cm^2/g	4630	5220	4380	3560	4420	4730	4480 (*)	3780 (*)	4400 (*)
wt% residue @	**45µm**	**5,1**	**0,6**	**4,8**	**1,6**	**1,4**	**3,0**			
	40µm							**2,7**		**1,5**
	32µm		**2,3**			**5,9**	**6,3**	**7,9**		**3,7**
MPa @	1D	6,1	7,5	5,0	14,3	16,3	15,8		23,1	
	2D							35,7	33,9	
	3D	14,4	15,1	15,5	25,6	26,4	25,8			
	7D	20,0	20,8	20,3	31,2	31,4	28,5			31,7
	28D	30,3	29,8	30,4	38,2	36,2	36,6	60,2	56,4	48,2

(*) from LASER analyser

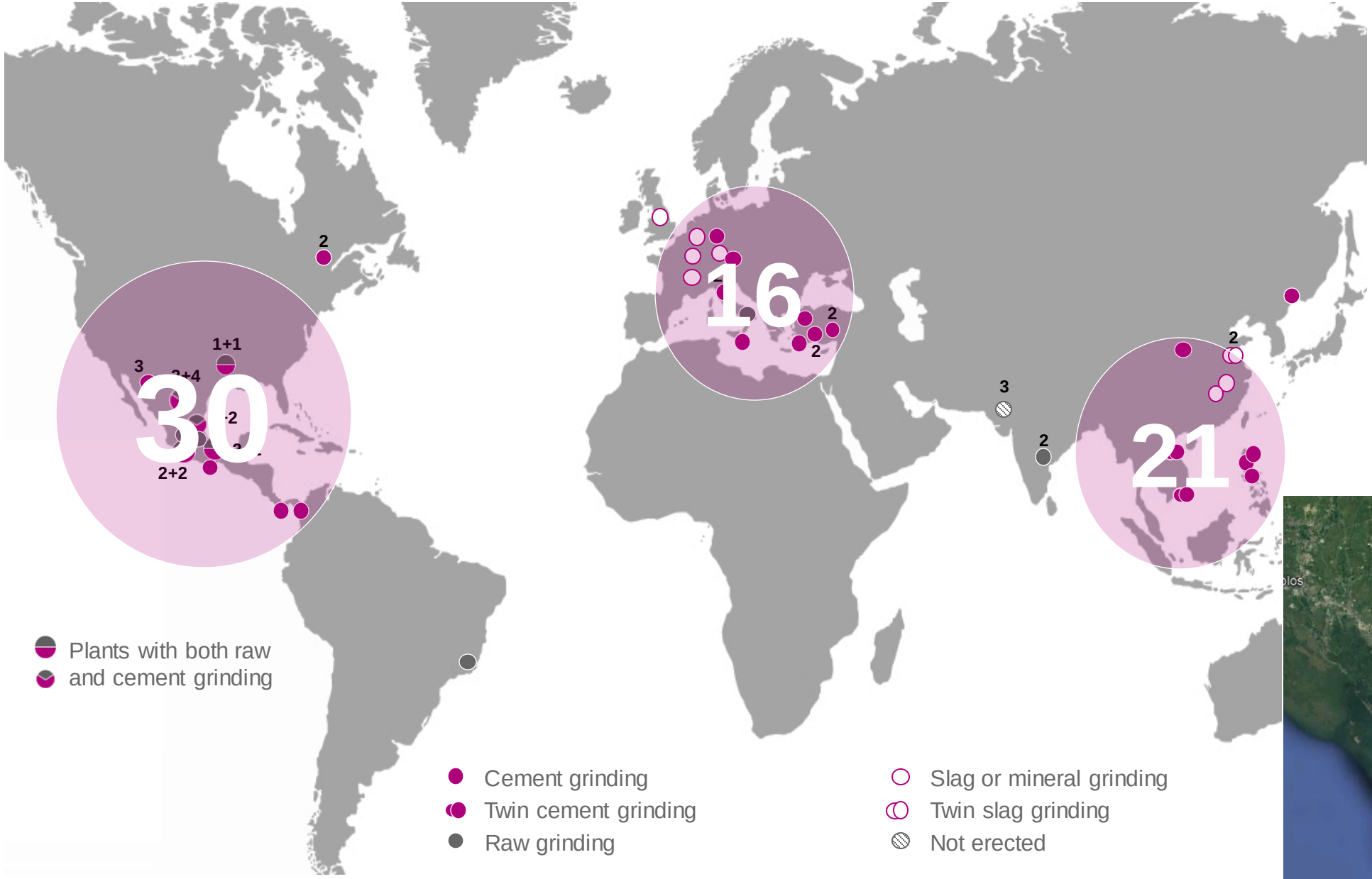
Better resistance @ lower Blaine

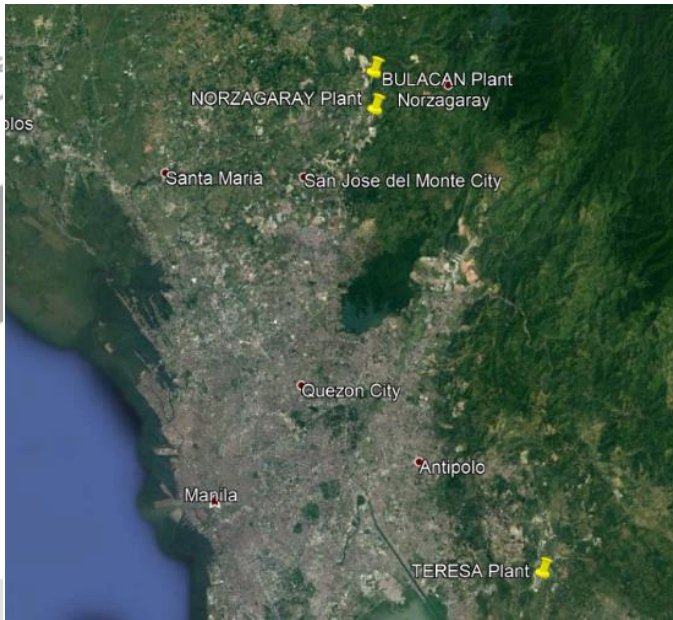
CONCLUSION: KEY BENEFITS OBTAINED

- **Best energy savings** available compared to any other system: **15 to 50% savings**
- **Excellent and proven products qualities**
- **High Clinker Substitution Ratios with high moisture content additives**
- Ease of operation with **fully automated control system**
- Ease of maintenance and high reliability

In a tense market with strong demand, FCB Horomill® was selected as giving **maximal flexibility** and **competitive edge on power consumption and product quality**, as well as being **ready for additional blended cement** recipes.

FCB HOROMILL® WORLDWIDE GRINDING PLANTS





fives

Industry can do it

Fives FCB

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