

# Analysis of worldwide Portland Cement Market Size and Their Properties

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## *Abstract*

Portland cement concrete that's Portland cement when combined with water, hardens into a solid mass. qualitative analysis of cement raw materials gave knowledge into the substance properties of cement. during this paper we are discussing about the varied chemical composition and properties of hydraulic cement. during this paper we also are discussing about the market size of hydraulic cement and application of cement and their ratio.

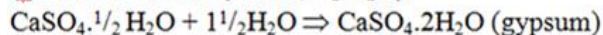
*Keywords: Silica, Lime, fineness. gypsum etc.*

## I. INTRODUCTION

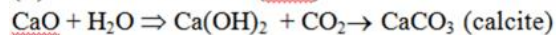
Portland concrete is an essential component of concrete. Portland solid makes a paste with water that attaches with sand and rock to harden to structure a strong. These solid has a substance formation of calcium, silicon, aluminum, iron and various fixings. Non-water fueled cements, and pressure driven cement are 2 noteworthy classes of progress concrete. Non-pressure driven cement doesn't set in wet conditions or lowered. Weight driven cements set and become stick due to a manufactured reaction between the dry fixings and water.

Non-hydraulic cements e.g.

(i) Plaster of Paris ( $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$ )



(ii) lime-based cement (CaO)



## II. PORTLAND CEMENT CHEMICAL COMPOUNDS OF PORTLAND CEMENT

It is create by finely ground limestone and finely divided clay to give a burned product containing 65-70% CaO, 18-24% SiO<sub>2</sub>, 3-8% Fe<sub>2</sub>O<sub>3</sub>, 3-8% Al<sub>2</sub>O<sub>3</sub> with some others Na<sub>2</sub>O, K<sub>2</sub>O, MgO, etc. Present day plants grant considerably more proficient handling and moreover, proportion raw mix compositions to create a cement from which a range of strength development and robustness properties can be expected. Effective crushing and mixing of raw materials is fundamental.

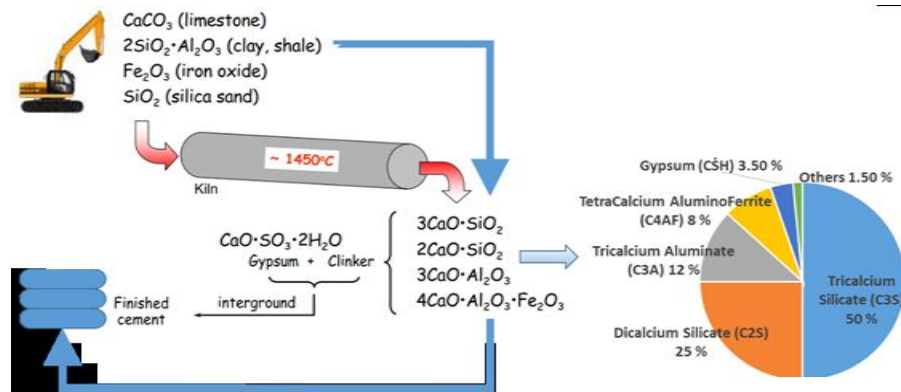


Fig 1 Portland Cement manufacturing

This table shows the chemical compounds of Portland cement, its formula and properties of this compound with weight.

**TABLE 1**  
**CHEMICAL COMPOUNDS OF PORTLAND CEMENT**

Compound	Formula	Shorthand form	% by weight	Properties of cement compounds
Alite or tricalcium silicate	$\text{Ca}_3\text{SiO}_4$	C <sub>3</sub> S	50 - 70%	<ul style="list-style-type: none"> <li>It is responsible for early strength</li> <li>First 7 days strength is due to C<sub>3</sub>S</li> <li>It produces more heat of hydration</li> <li>Cement with more C<sub>3</sub>S is better for cold weather concreting.</li> </ul>
Belite or dicalcium silicate	$\text{Ca}_2\text{SiO}_5$	C <sub>2</sub> S	15 - 30%	<ul style="list-style-type: none"> <li>C<sub>2</sub>S hydrates after 7 days. Hence, it gives strength after 7 days.</li> <li>C<sub>2</sub>S hydrates and harden slowly and provides much of the ultimate strength</li> <li>It produces less heat of hydration.</li> <li>Responsible for long term strength</li> </ul>
Tricalcium aluminate	$\text{Ca}_3\text{Al}_2\text{O}_6$	C <sub>3</sub> A	5 - 10%	<ul style="list-style-type: none"> <li>The reaction of C<sub>3</sub>A with water is very fast and may lead to an immediate stiffening of paste, and this process is termed as <b>flash set</b>.</li> <li>To prevent this flash set, 2 to 3% gypsum is added at the time of grinding the cement clinkers.</li> <li>C<sub>3</sub>A liberates a lot of heat during the early stages of hydration, but has little (almost none) strength contribution.</li> <li>Cement low in C<sub>3</sub>A is sulfate resistant.</li> </ul>
Tetracalcium aluminoferrite	$\text{Ca}_4\text{Al}_2\text{Fe}_2\text{O}_{10}$	C <sub>4</sub> AF	5-15%	<ul style="list-style-type: none"> <li>It hydrates very rapidly.</li> <li>Contributes very little strength of concrete even though</li> <li>Also responsible for grey colour of Ordinary Portland Cement</li> <li>The hydrates of C<sub>4</sub>AF show a comparatively higher resistance to sulphate attacks than the hydrates of C<sub>3</sub>A</li> </ul>
Sodium oxide	$\text{Na}_2\text{O}$	N	0.5 -	
Potassium oxide	$\text{K}_2\text{O}$	K	1.3%	
Gypsum	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	CSH <sub>2</sub>		

The graph 2 shows the market size of Portland cement and other from 2014 to expected 2015. Fig 3 shows the application of cement and their ratio.

### III. ANALYSIS OF GLOBAL PORTLAND CEMENT MARKET SIZE AND SHARE

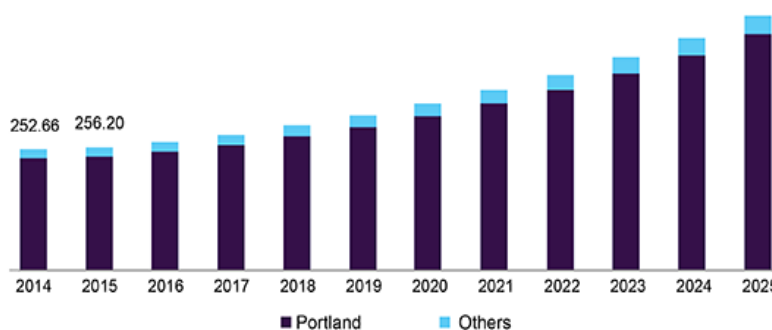


Fig 2 Cement market size

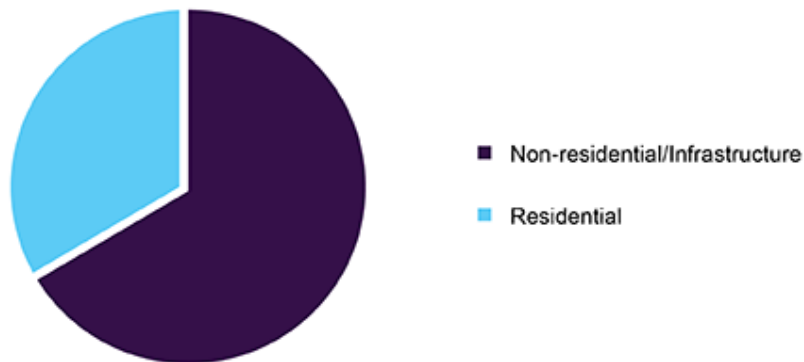


Fig 3 Global cement market share

#### IV. CONCLUSION

Portland cement is used worldwide. In this paper we have discussed about the various chemical composition and properties of Portland cement. In this paper we have also discussed about the market size of Portland cement and application of cement and their ratio.

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