PRODUCT CATALOG

Early History and Development of Portland Cement

The word "cement" is derived from the Latin word “caementum”, which means hewn stone piece, and started to be used in the meaning of “binder”. Date of the first reinforced concrete structure is 1852 but use of binding materials in the construction of the structures dates back to old times; the first materials to have been used as a binding agent is lime.

Even though there is no definite finding on the subject, it can be said that the binding characteristic of lime was discovered around B.C. 2000 in the early periods of the history of humanity. Examples of lime used as construction material were found in different regions of the Ancient Egypt, Cyprus, Crete and Mesopotamia. Ancient Greeks and Romans used lime as hydraulic binder. Architect – Engineer Marcus Vitruvius Pollio, who lived between the years B.C. 70-25, mentioned the hydraulic properties of pozzolana and lime mixtures in his 10 volume book titled “De Architectura (On Architecture) and even gave a mixture ratio for the mortar to be used in the structures to be constructed on the river and sea shores. Research results revealed that the plaster used in the construction of the houses at Çatalhoyuk in Anatolia dated back to 7000 years ago.

Ancient Greeks and Romans realized the hydraulic properties of the lime and pozzolana mixtures and used these but they never could have the knowledge to explain either how the lime was obtained or pozzolanic reactions chemically. For example, Pliny (Roman scholar Gaius Plinius) wrote that why the lime obtained by burning the stone with fire was reburnt when contacted with water was incomprehensible. Significant development in the quality and use of binding materials barely occurred in the 18th Century. In 1756, John Smeaton, who was assigned for reconstructing Eddystone Lighthouse, is known as the first person to comprehend the chemical properties of the lime. The development afterwards occurred after binding material known as “Roman Cement” was obtained by Joseph Parker.

In 1824, in the Leeds city of England, a mason named Joseph Aspdin burned the mixture of fine-grained clay and limestone and obtained a binding product by grinding. Having seen that the material emerging resembled the building stones obtained from Portland Island in England when water and sand was added to this product and it hardened in time, Joseph Aspdin obtained the patent no.5022 under the name of “Portland Cement” for this binder on 21.10.1824. Even though this binder showed great improvements in the years to come, the name “Portland” preserved.

In fact, the binder produced by Joseph Aspdin could not fully own the properties of Portland cement of our day as it was not burned at a sufficiently high temperature during production. Nevertheless, it was found out that the building “Wakefield Arms”, which still stands near Kirkgate Station in England, was constructed with the binder produced by Joseph Aspdin. Burning the raw materials at high temperatures and grinding was realized by the British Isaac Johnson afterwards (1845).

As for Anatolia, it was seen that pozzolanic active natural materials mixed with magnesia lime were used in mortar in Hittite cities, especially in the ancient cities in Çorum, Tokat and Malatya.

In addition to this, examples such as the use of common lime and basaltic pozzolanic material in the historical ruins of Assyrian period in the Southeastern Anatolia show that cement was used before Romans and Greeks. It is seen that cement and mortar were used in ancient cities of Teos- İzmir, Ephesus- İzmir, Afrodisias- Aydın, Kinidas- Muğla.

In addition, our sector has made significant progress in the production of electricity from waste heat and has used approximately 50 percent of the existing capacity. In this area, it is much more successful than the factories in Europe; thus contributing to the economy of the country and providing economic benefits, and thanks to the reduction of greenhouse gas emissions, it has made a significant contribution to the fight against climate change.

What is Cement ?

Portland Cement is the material obtained by grinding the clinker with a certain amount of gypsum and additives in the appropriate ratio depending on the type of cement. When the cement is blended and mixed with the aggregate and water in the appropriate ratio, it must maintain its workability for a sufficient period of time and reach certain strength levels in specified periods and exhibit volume stability for a long time. Definition of Cement in TS EN 197-1 Standard, Cement is an inorganic and finely grounded hydraulic binder which forms a hardening dough (paste) that gets set due to hydration reactions and processes when mixed with water still maintains its stability. It continues to remain stable even underwater after the hardening process.

Cement Terminology

Strength

It is the result of strength obtained by breaking the cement into concrete prism at the age of 2, 7 and 28 days with pressure test device as described in TS EN 196-1 standards.

Early Strength

The early strength of cement is the compressive strength of 2 and 7 days determined according to TS EN 196-1. Normal early strength is defined by "N" and high early strength by "R".

Setting Time

It is the period from the moment the cement paste, which has been tempered according to TS EN 196-3 standards, into contact with water, freezes or hardens according to the standard criteria. It allows the time required for workability of cements in concrete or mortar applications. There must be a minimum of 75 minutes for the "32.5" strength class, 60 minutes for the "42.5" strength class and a minimum of 45 minutes for the "52.5" strength class.

Expansion

It is the change in the volume of the mortar consisting of cement paste which has been brought into consistency according to TS EN 196-3 standards.
The volume expansion must be a maximum of 10 mm per strength class.

Blaine (Specific Surface)

It is a kind of fineness expression of cement. It refers to the surface area covered by all the particles forming one gram of cement. It is determined by the method in TS EN 196-6 standards and displayed in cm^2 / gr.

Cement Type	Name	Notation	Main Components (% Mass)										Minor Additional Components
			Clinker K	Blast Furnace Slag S	Silica Smoke D	Natural Pozzolan P	Industrial Pozzolan Q	Silica Fly Ash	Limestone Fly Ash W	Terracotta Shale T	Limestone L	Calcer LL	
CEM I	Portland Cement	CEM I	95-100	-	-	-	-	-	-	-	-		0-5
CEM II	Portland Slag Cement	CEM II/A-S	80-94	6-20	-	-	-	-	-	-	-	-	0-5
		CEM II/B-S	65-79	21-35	-	-	-	-	-	-	-	-	0-5
	Portland Silica Smoky Cement	CEM II/A-D	90-94	-	6-10	-	-	-	-	-	-	-	0-5
	Portland Puzolan Cement	CEM II/A-P	80-94	-	-	6-20	-	-	-	-	-	-	0-5
		CEM II/B-P	65-79	-	-	21-35	-	-	-	-	-	-	0-5
		CEM II/A-Q	80-94	-	-	-	6-20	-	-	-	-	-	0-5
		CEM II/B-Q	65-79	-	-	-	21-35	-	-	-	-	-	0-5
	Portland Fly Ash Cement	CEM II/A-V	80-94	-	-	-	-	6-20	-	-	-	-	0-5
		CEM II/B-V	65-79	-	-	-	-	21-35	-	-	-	-	0-5
		CEM II/A-W	80-94	-	-	-	-	-	6-20	-	-	-	0-5
		CEM II/B-W	65-79	-	-	-	-	-	21-35	-	-	-	0-5
	Portland Shale Cement	CEM II/A-T	80-94	-	-	-	-	-	-	6-20	-	-	0-5
		CEM II/B-T	65-79	-	-	-	-	-	-	21-35	-	-	0-5
	Portland Calcareous Cement	CEM II/A-L	80-94	-	-	-	-	-	-	-	6-20	-	0-5
		CEM II/B-L	65-79	-	-	-	-	-	-	-	21-35	-	0-5
		CEM II/A-LL	80-94	-	-	-	-	-	-	-	-	6-20	0-5
		CEM II/B-LL	65-79	-	-	-	-	-	-	-	-	21-35	0-5
	Portland Composite	CEM II/A-M	80-94	6-20									0-5
		CEM II/B-M	65-79	21-35									0-5
CEM III	Blast Furnace Slag Cement	CEM III/A	35-64	36-65	-	-	-	-	-	-	-	-	0-5
		CEM III/B	20-34	66-80	-	-	-	-	-	-	-	-	0-5
		CEM III/C	5-19	81-95	-	-	-	-	-	-	-	-	0-5
CEM IV	Pozzolanic Cement	CEM IV/A	65-89	-	11-35					-	-	-	0-5
		CEM IV/B	45-64	-	36-55					-	-	-	0-5
CEM V	Composite Cement	CEM V/A	40-64	18-30	-	18-30			-	-	-	-	0-5
		CEM V/B	20-38	31-50	-	31-50			-	-	-	-	0-5

About Portland Cement

Cement Production Stages

Cement production technology consists of five main steps.

1- Raw Material Preparation
2- Raw Milling
3- Cooking
4- Cement Production
5- Packaging

Raw Material Preparation

The main raw materials of cement are limestone and clay. In the production of clinker, which is an intermediate of cement , iron ore, bauxite, sand etc. auxiliary materials are additionally used. These materials are taken from the natural environment by the quarry operation method. These materials are subjected to stocking, pre-mixing and various crushing processes at the factory site to reduce the material size.

Raw Milling

Limestone, clay, iron ore, etc. having a certain chemical composition. material is ground to a fine powder. This powder is called “raw meal.. In order to obtain a good clinker, the raw meal is homogenized and stored in silos.

Cooking

Raw meal is fed from the raw meal silos to the preheater for cooking. In the preheater, the hot gas from the oven moves upwards as the headlight moves downwards. In the preheater, which consists of several stages of cyclone combinations, the pre-calcination process takes place by contacting raw gas with hot gas. Pre-calcined raw meal enters the rotary kiln. Fuels such as powdered coal, natural gas and fuel oil are burned by the flame tube located at the furnace outlet. The temperature of the furnace increases to 1500-1600 ° C with the burning fuel and clinker reactions. As the material approaches the outlet in the oven, it starts to liquefy. Fine grains combine to form large clinker grains. The resulting clinker grains pass through the furnace outlet to the cooling unit and are cooled immediately. The temperature of the instant cooled clinker beads is reduced to below 100 ° C and stored in the clinker stock hall.

Cement Production

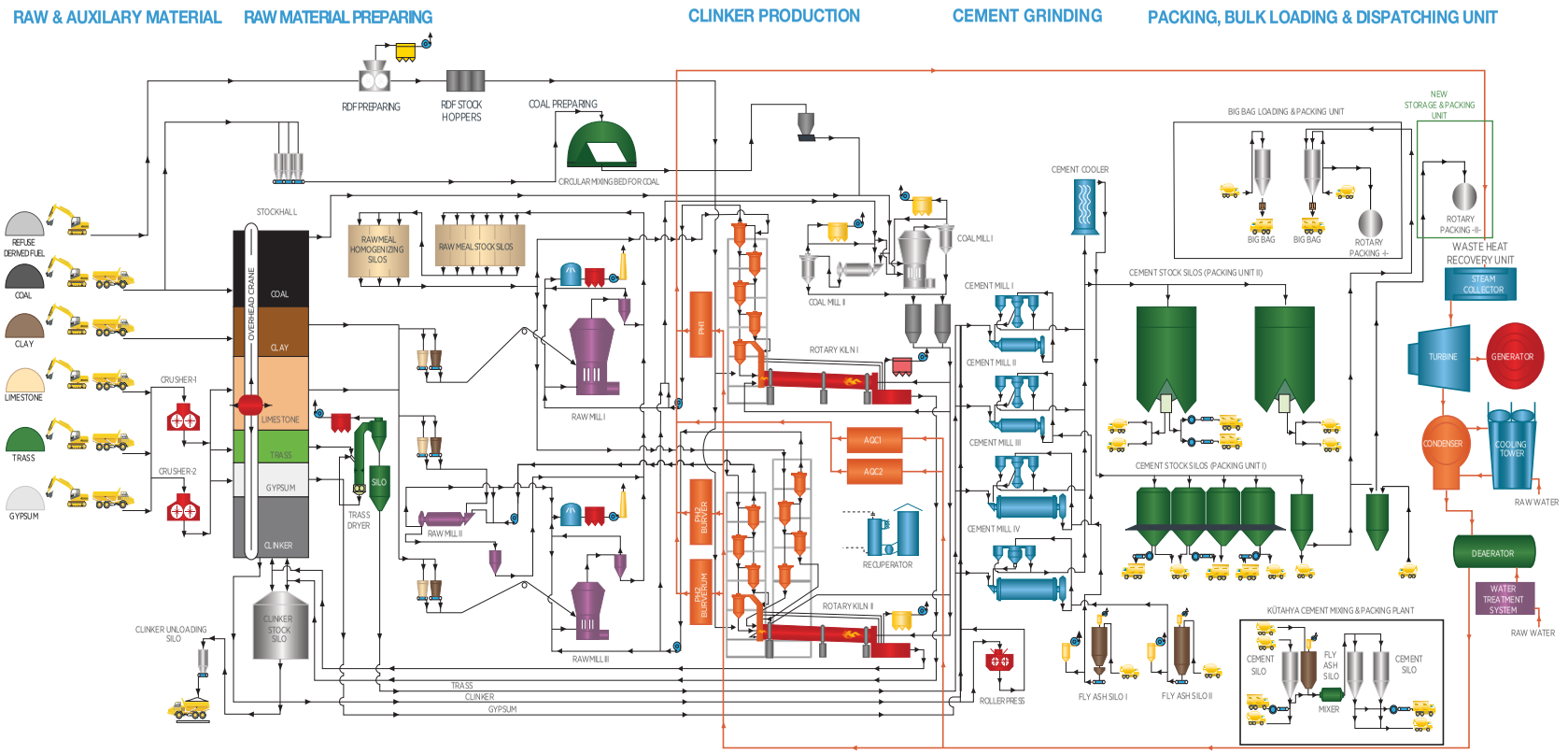
Portland Cement is depending on the type of gypsum and Portland cement clinker, pozzolan, limestone, fly ash etc. Cement is obtained as a result of grinding with additives such as. Ball mills are commonly used in grinding cement. Cement ground in fine powder is stored in silos.

Packaging

Cements stored in silos according to cement types are supplied to the market in bulk or bagged according to the demands of the market.

Lexem Cement

Production Flow Sheet



OVERHEAD CRANE
OVERHEAD CRANE-1 (5 t/scoop)
OVERHEAD CRANE-2 (5 t/scoop)
OVERHEAD CRANE-3 (6 t/scoop)

CRUSHER
CRUSHER-1 250 t/h
CRUSHER-2 300 t/h

CLINKER STOCK SILO
CLINKER STOCK SILO 50,000 Ton
CLINKER STOCK SILO 1,000 Ton

TRASS DRYER
TRASS DRYER 100 t/h
TRASS DRYER STEEL SILO 1,000 Ton

RAW MILL
RAW MILL-1 200 t/h
RAW MILL-2 52 t/h
RAW MILL-3 100 t/h

RAW MEAL SILO
RAW MEAL HOMOGENIZING SILO 2x2,200 Ton 1x5,000 Ton
RAW MEAL STOCK SILO 6x500 Ton

ROTARY KILN
ROTARY KILN - 1 2,200 t/day
ROTARY KILN - 2 1,850 t/day
RECUPERATOR 5 t/h dry steam
ABSORPTION CHILLER UNIT 800 kw

COAL MILL
COAL MILL - 1 : 20 t/h
COAL MILL - 2: 30 t/h

CIRCULAR MIXING BED FOR COAL
200 t/h stacking rate
80 t/h reclaiming rate
CIR. MIX. BED OPEN COAL STOCK AREA - 14.000 ton
CIR. MIX. BED CLOSED COAL STOCK AREA - 1 1.270 ton

GRINDED COAL STOCK SILO
100 m^3 coal stock silo
200 m^3 coal stock silo

RDF FACILITY
SHREDDER 1: 25t/h
SHREDDER 2: 10 t/h

RDF STOCK HOPPERS
3 ADET 300 m^3 BUNKER

CEMENT MILL
CEMENT MILL-1 50 t/h
CEMENT MILL-2 60 t/h
CEMENT MILL-3 100 t/h
CEMENT MILL-4 175 t/h
CEMENT COOLER 150 t/h

ROLLER PRESS
ROLLER PRESS 300 t/h

CEMENT STOCK SILO
CEMENT STOCK SILO 2x10.000 Ton 4x2.500 Ton 2x1.000 Ton 2x120 Ton

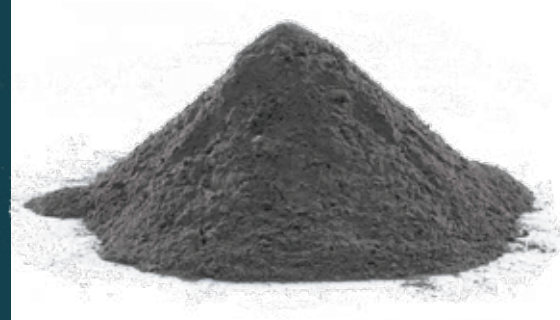
FLY ASH STOCK SILO
500 Ton
900 Ton

PACKING & BULK LOADING UNIT
PACKING CEMENT LOADING SYSTEM ROTARY PACKING 4x70 t/h 2x120 t/h 2x80 t/h
BULKLOADING SYSTEM 3x150 t/h 6x200 t/h
BIG BAG LOADING & PACKING UNIT (2x30 t/h)

WASTE HEAT RECOVERY UNIT
7,5 MW TURBINE - GENERATOR

About Portland Cement

Our Products



Product Name
CEM I 42.5 R Portland Cement

42,5 Kg-50Kg Packaged / 1,5 MT Bigbag / Bulk

CEM I 42, 5R is the product which is obtained by grinding clinker, that is acquired by mixing raw materials like limestone, marl, clay, iron ore, pyrite ash, bauxite etc. at appropriate rates, grinding and boiling them, with an amount of reamer (generally gypsum) and mixing it with water that gains resistance by freezing up at a certain times. It may be generally used in areas where normal portland cements are used and it is also suitable for use in areas exposed to sulphated water like dam constructions, tunnels, port constructions, irrigation channels, construction chemicals if the amount of C3A is below 5%.

Product Name
CEM I 52.5 R Portland Cement

42,5 Kg-50Kg Packaged / 1,5 MT Bigbag / Bulk

Usage Areas
CEM I 52, 5R is the product which is obtained by grinding clinker, that is acquired by mixing raw materials like limestone, marl, clay, iron ore, pyrite ash, bauxite etc. at appropriate rates, grinding and boiling them, with an amount of reamer (generally gypsum) and mixing it with water that gains resistance by freezing up at a certain times.In general, the structures that require high strength, cold weather in poured concrete , prefabricated structures , tunnels – in the mold applications , construction chemicals used in the manufacture and application of concrete foundation .

Product Name
CEM IV B-P 32,5R Puzolanic Cement

42,5 Kg-50Kg Packaged / 1,5 MT Bigbag / Bulk

Usage Areas
It is obtained by grinding a certain amount of portland cement clinker with mineral (pozzuolana) at proportions (maximum 55%) defined in respective standards with reamer (gypsum) and gains resistance by freezing a while after it is mixed with water.

CEM IV B-P 32,5R Puzolanic Cement gains resistance later than Portland cement (CEM I 42,5 R and CEM I 52,5 N-R) and Portland Pozzolanic Cement (CEM II/A-P 42,5 R). Water/cement rates are also relatively higher. It is more resistant to alkali-aggregate reaction and chemical external factors. It is generally used in repair works in constructions, plastering and production of construction chemicals.

LeXem CEMENT

CEM I 42.5 R Portland Cement

Numunenin Adı (Sample Type)	CEM I 42,5 R	Rapor No: 33 Report No
Üretim ve Numune Tarihi (Date of Production &Sampling) (22-28).07.2019		Analiz Tarihi (Date of Analysis) 29.07.2019
Rapor Tarihi (Date of Report)	27.08.2019	

Kimyasal Analiz (Chemical Analysis %)	Analiz Sonuçları (Result of Analysis)	Standard No TS EN 197-1:2012 (EN 197-1:2011)
SiO2	19,64	
Al2O3	4,94	
Fe2O3	3,28	
CaO	63,21	
MgO	3,18	
SO3	2,67	Max. %4,0
K2O	0,66	
Na2O	0,41	
Cl^-	0,0086	Max. % 0,1
Serbest CaO, Free CaO	0,78	
Kızdırma Kaybı, Loss on Ignition	2,41	Max. % 5,0
Çözünmeyen Kalıntı, Insoluble Residue	0,28	Max. % 5,0
Toplam Katkı (Minör), Total Additive (Minor)	4,09	Max. % 5,0
Testler EN 196-1,2,3,4,6,10 uygun yapılmıştır.		
Tests were undertaken in accordance with European Standard EN 196-1,2,3,4,6,10		

Fiziksel ve Mekaniksel Analiz(%) Physical and Mechanical Analysis(%)	Analiz Sonuçları Result of Analysis	Standart Değerler TS EN 197-1:2012 Standard Values EN 197-1:2011
Özgül Ağırlık (gr/cm³) , Specific Gravity (gr/cm³)	3,18	
Özgül Yüzey (cm²/gr), Specific Surface (cm²/gr)	3372	
45µ elek üstü %, (Residue on 45µ sieve %)	9,5	
90µ elek üstü %, (Residue on 90µ sieve %)	0,5	
Priz Başlangıç Süresi (dakika) , Initial Setting Time (minute)	175	Min. 60
Priz Bitiş Süresi (dakika) , Final Setting Time (minute)	280	
Hacim Genleşmesi, Soundness (mm)	1	Max. 10
Basınç Dayanımı Compressive Strength (MPa)		
1 Gün (Day)	-	
2 Gün (Days)	26,2	Min. 20,0
7 Gün (Days)	40,4	
28 Gün (Days)	50,9	Min. 42,5- Max. 62,5

Kalite Kontrol Uzmanı Quality Control Specialist	Kalite Kontrol ve Lab. Yöneticisi Quality Control and Lab. Superintendent
	

Test Reports

CEM I 52.5 R Portland Cement

Numunenin - Sample:	: ÇİMENTO (CEMENT)	**Standart: TS EN 197-1/2011 - CEM I 52,5 R**
Numunenin Alındığı Yer- Origin of the sample	: PAKETLEME	Rapor No -Report No: MERKEZ-02
Numunenin Alındığı Tarih- Date of the sample	: 01.07.2019-31.08.2019	
Rapor Tarihi - Report Date	: 23.09.2019	

KİMYASAL ANALİZ (CHEMICAL ANALYSES)		**STANDARDLAR (STANDARDS)**	**DENEY SONUÇLARI (TEST RESULT)**
SiO2	%	-	19,40
Al2O3	%	-	4,93
Fe2O3	%	-	3,29
CaO	%	-	64,06
MgO	%	-	1,10
SO3	%	**≤ 4,0**	2,87
Na2O	%	-	0,20
K2O	%	-	0,63
Cl⁻	%	**≤ 0,10**	0,0115
Kızdırma Kaybı (Loss on ignation)	%	**≤ 5,0**	3,45
Çözünmeyen Kalıntı (İnsoluble Residue)	%	**≤ 5,0**	0,34
FİZİKSEL TESTLER (PHYSICAL TESTS)			
Priz Süresi (dakika) (Setting Time) (Minute)	Başlangıç (Inital)	**≥ 45**	150
	Son (Final)	-	200
Yoğunluk (g/cm3) (Specific gravity)		-	3,12
Özgül Yüzey (cm2/gr) (Spesific Surface) (Blaine)		-	3889
Toplam Hacim Genleşmesi(mm) (Le Chatelier)		**≤ 10,0**	1
45 µ Elek Üzeri Kalıntı		-	2,26
90 µ Elek Üzeri Kalıntı		-	
BASINÇ DAYANIMI (Compresive Strength)			
Mekanik Özellik- Gün (Mechanical Charecteristic/day)	Erken Dayanım 2 Gün Early Strengh 2 Day	**≥ 30 Mpa**	34,4
	Erken Dayanım 7 Gün Early Strengh 7 Day	-	51,7
	Standart Dayanım 28 Gün Standart Strengh 28 Day	**≥52.5 Mpa**	63,2

FR-KK-02-6 R: 0

Deney TanımlarıYukarıda Tanımlanan Numuneye Aittir. 01.10.2015

(The Test Results Relate Only To The Items Tested.)

Bu Rapor Deney Laboratuvarının yazılı İzni Olmadan Çoğaltılamaz

(The Report Shall Not Be Reproduced Except In Full Without The Written Approved Of The Testing Laboratory.)

KALİTE KONTROL ŞEFİ

CEM IV B-P 32,5R Puzolanic Cement

Numunenin Adı (Sample Type)	CEM IV/B (P) 32,5 R	Rapor No: 09 Report No
Üretim ve Numune Tarihi (Date of Production &Sampling) (01-30).09.2019	Analiz Tarihi (Date of Analysis) 1.10.2019	
Rapor Tarihi (Date of Report)	8.11.2019	

Kimyasal Analiz (Chemical Analysis %)	Analiz Sonuçları (Result of Analysis)	Standard No TS EN 197-1:2012 (EN 197-1:2011)
SiO_2	28,87	
Al_2O_3	8,23	
Fe_2O_3	6,67	
CaO	41,98	
MgO	5,15	
SO_3	2,20	Max. %3,5
K_2O	0,95	
Na_2O	1,27	
Cl^-	0,0146	Max. % 0,1
Serbest CaO, Free CaO	0,57	
Kızdırma Kaybı, Loss on Ignition	3,82	
Toplam Katkı, Total Additive	40,93	% 36-55
Testler EN 196-1,2,3,4,6,10 uygun yapılmıştır.		
Tests were undertaken in accordance with European Standard EN 196-1,2,3,4,6,10		

Fiziksel ve Mekaniksel Analiz(%) Physical and Mechanical Analysis(%)	Analiz Sonuçları Result of Analysis	Standart Değerler TS EN 197-1:2012 Standard Values EN 197-1:2011
Özgül Ağırlık (gr/cm³) , Spesific Gravity(gr/cm³)	3,03	
Özgül Yüzey (cm²/gr), Specific Surface (cm²/gr)	5197	
45µ elek üstü %, (Residue on 45µ sieve %)	4,1	
90µ elek üstü %, (Residue on 90µ sieve %)	0,2	
Priz Başlangıç Süresi (dakika), Initial Setting Time (minute)	205	Min. 75
Priz Bitiş Süresi (dakika), Final Setting Time (minute)	305	
Hacim Genleşmesi, Soundness (mm)	1	Max. 10
Basınç Dayanımı Compressive Strength (MPa)		
1 Gün (Day)	-	
2 Gün (Days)	17,5	Min. 10,0
7 Gün (Days)	27,3	
28 Gün (Days)	36,2	Min. 32,5 - Max.52,5

Kalite Kontrol Uzmanı Quality Control Specialist	Kalite Kontrol ve Lab. Yöneticisi Quality Control and Lab. Superintendent

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