PROPOSAL FOR REHABILITATION WORKS OF ALANGULAM CEMENT FACTORY

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Abstract : **Cement is the basic material for buildings and civil engineering constructions. Portland cement, the most widely used cement in concrete construction, was patented in 1824. Cement is a fine powdery material untwining silicates of calcium, formed out of raw materials consisting calcium oxide, silica, aluminum oxide and iron oxide. India has an installed capacity of 234 million tons per year, making this is the second highest**

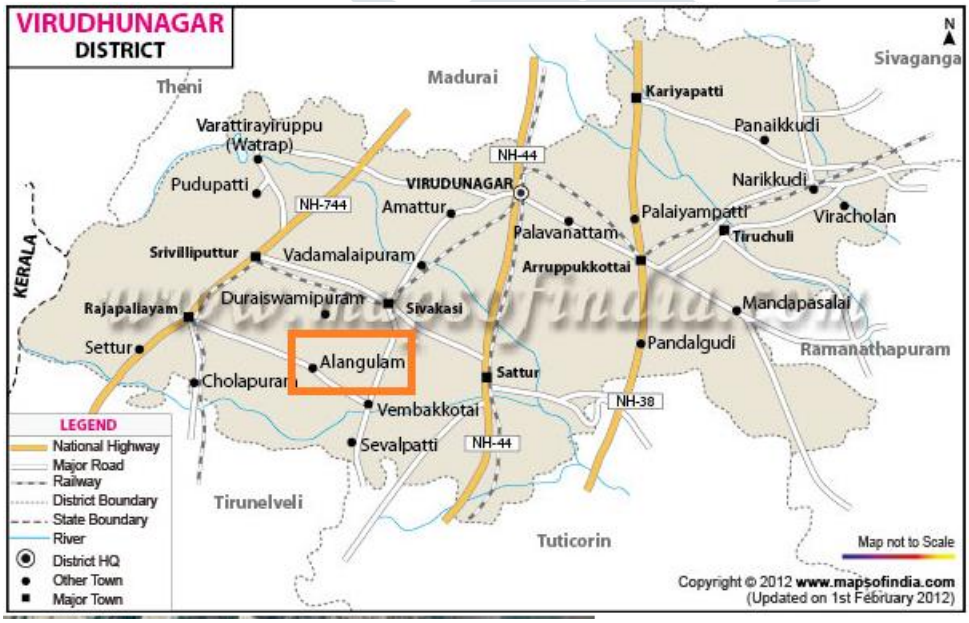
Alangulam Cement Factory was commissioned during 1970 producing cement by "WET PROCESS". Due to long run operation of the factory and due to aging of machineries, the unit is unable to operate the Plant with efficient manner. Due to the above reason, the production efficiency is getting reduced and increasing the production cost. The main goal of this article is to increase the production efficiency and reduce the production cost by Rehabilitation works

I. INTRODUCTION

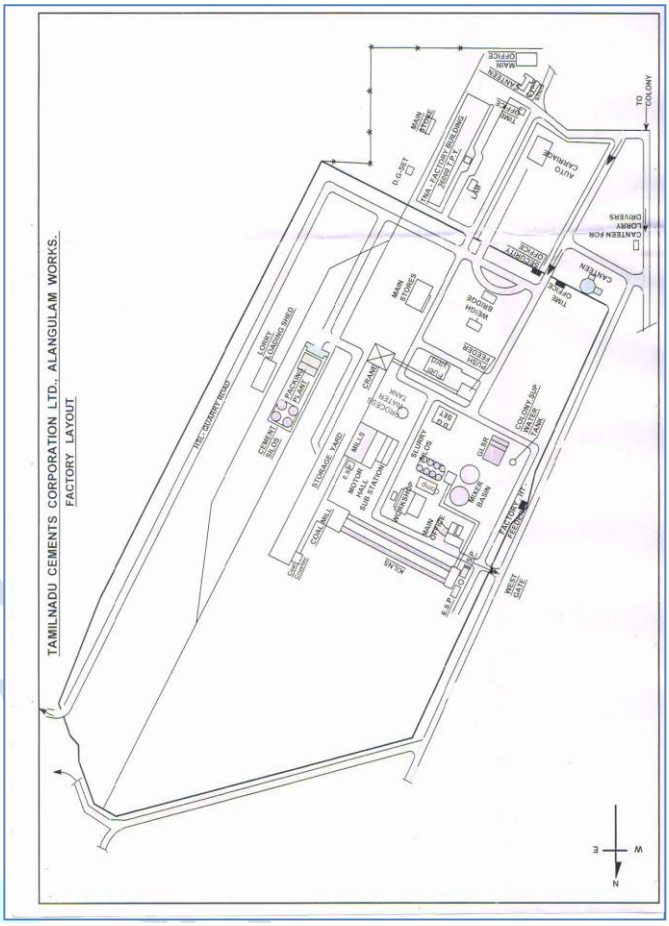
Alangulam Cement unit was established on 30.11.1966 to install machineries to produce Cement adopting 'WET PROCESS" method with a capital outlay of 6.77 corers by TIDCO. The commercial production of the plant was commenced on 14.06.1970
The unit commenced its regular production with 2 Kilns operation having Clinker production capacity of 1200 Tonnes/day provided with labour employment of 1700 direct and indirect.
In the year 1976, a separate corporation named "TAMILNADU CEMENTS CORPORATION LTD" was formed with Alangulam and Ariyalur Cement Units.
The installed capacity of the plant is 4.0 Lakh tones of cement per annum with the average achieved capacity utilization of 75%.Unit has achieved the maximum capacity utilization of 85% in two Kiln operation during the year 1984-85.
Due to administrative reasons, the unit is being operated in single steam operation of one Kiln, Raw Mill & Cement Mills, from the year 2003 and the other Kiln-I & Raw Mill-I units have been phased out and removed.Unit has achieved the maximum capacity utilization of 89% in single kiln operation during the year 2005-2006.
Unit has achieved the maximum net profit of Rs.515.87 Lakh during the year 2016-2017. Due to administrative reasons and to operate the plant economically, plant operation has been restricted to operate the plant as Cement Grinding Unit with effect from 20.09.2017

LOCATION OF THE UNIT

Location of unit is most important factor for to be consideration for successful working of any organization. It also plays vital role in the development of the unit. The total cost of manufacturing cost of any business unit is higher due to the wrong selection of location of their business. The main objective of an industry concern is to maximize the profit by minimising the production cost
TAMILNADU CEMENTS CORPORATION LIMITED is situated near Alangulam village near Rajapalayam, Virudhunagar District
Alangulam is located in India at the **longitude** of 77.5 and **latitude** of 8.86



The location of the plant is very beneficial for its existences as the area is surrounded by limestone, which is one of the basic raw materials in cement production.
Location factors are very much important in establishing a cement plant.



1. Input
In terms of input, about 1.5 tons of limestone is required to produce one ton of cement. Hence location of the plant is based on the limestone deposit. The major cash out flow come by way of royalty and cash payments. India's estimated total reserve of cement grinding stone is about 90 billon tons.

2. Power
It is used in raw material grinding. Clinkerization of lime stone is done in the kiln operation and then clinker is grinding with gypsum to form cement. The older plant required 120 to 130 units per ton of cement produced, while modern energy efficient plants consume 80 to 90 units per ton of cement.

3. Coal
Coal is another major input, which along with electricity forms 40% of total cost. There is a several coal shortage for the industry.

4. Labor
On growing modernization of plants, the requirement for skilled man power has increased then that of unskilled man power. The cheap availability of labor from the nearby areas has proved to be great help for the company.

5. Transportation
It is a very important thing to be kept in mind while deciding the location. It cost widely affects the overall cost.

CEMENT MANUFACTURING PROCESS (WET)

The history of cement goes back into Roman Empire. The modern day cement. That is Portland cement was first produced by a British stone mason, Joseph Aspdin in 1824, who cooked cement in his kitchen. He heated a mixture of limestone and clay powder in his kitchen, and grind the mixture into powder creating cement, that hardens when mixed with water. The name Portland was given by the inventor as it resembles a stone quarried on the Isle of Portland.
The first use of modern day Portland cement was in the tunnel construction in the Thames River in 1828.
The manufacture procedures of Portland cement is described below.

- Mixing of raw material
- Burning
- Grinding
- Storage and packaging

1. Mixing of raw material

The major raw materials used in the manufacture of cement are Calcium, Silicon, Iron and Aluminum. These minerals are used in different form as per the availability of the minerals.
Table shows the raw materials for Portland cement manufacture

Calcareous Materials	Argillaceous Materials		
Calcium	**Silicon**	**Aluminum**	**Iron**
Limestone	Clay	Clay	Clay
Marl	Marl	Shale	Iron ore
Calcite	Sand	Fly ash	Mill scale
Aragonite	Shale	Aluminum ore refuse	Shale
Shale	Fly ash		Blast furnace dust
Sea Shells	Rice hull ash		
Cement kiln dust	Slag		

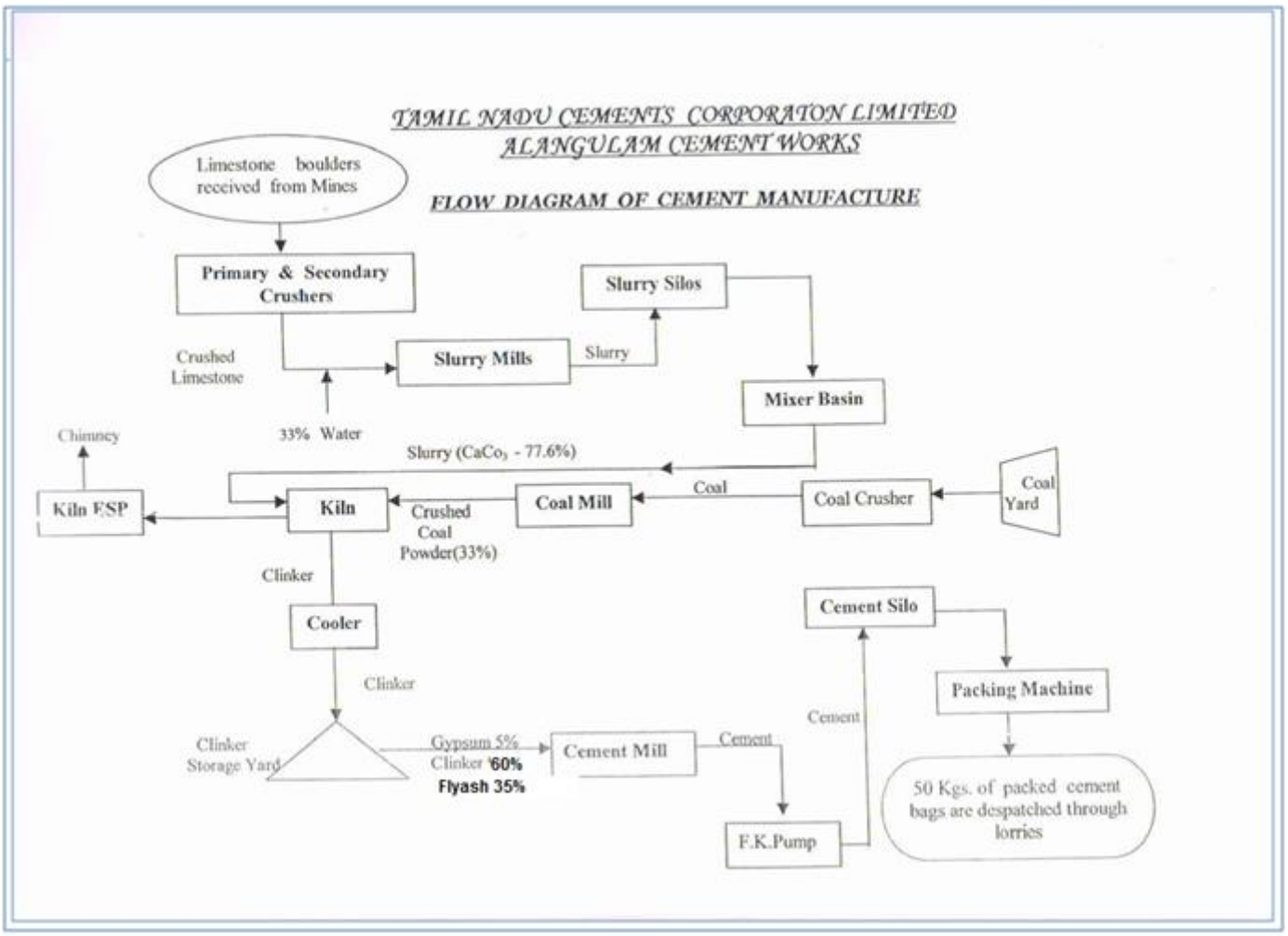
The mixing procedure of the manufacture of cement is done in 2 methods,

- Dry process
- Wet process

Dry process
The both calcareous and argillaceous raw materials are firstly crushed in the gyratory crushers to get 2-5cm size pieces separately. The crushed materials are again grinded to get fine particles into ball or tube mill.
Each finely grinded material is stored in hopper after screening. Now these powdered minerals are mixed in required proportion to get dry raw mix which is then stored in silos and kept ready to be sent into rotary kiln. Now the raw materials are mixed in specific proportions so that the average composition of the final product is maintained properly.

Wet Process
The raw materials are firstly crushed and made into powdered form and stored in silos. The clay is then washed in washing mills to remove adhering organic matters found in clay.
The powdered limestone and water washed clay are sent to flow in the channels and transfer to grinding mills where they are completely mixed and the paste is formed, i.e., known as slurry.
The grinding process can be done in ball or tube mill or even both. Then the slurry is led into collecting basin where composition can be adjusted. The slurry contains around 38-40% water that is stored in storage tanks and kept ready for the rotary kiln.

PRODUCTION PROCESS IN ALANGULAM CMENT FACTORY



PRODUCTION PROCESS

TANCEM follows a specific type of process.

The cement passes qualities and grades.

According to the mode of preparing the raw mix three different processes can manufacture cement.

A. Wet process
B. Semidry process
C. Dry process.

TANCEM uses Wet process cement manufacturing. The total process is divided into various stages which are:

Mining

The lime stone is mixed from pen cast quarry by conventional drilling and blasting method. The basic raw material for cement manufacture is lime stone. The lime stone is mined in captive mines and transported to primary crusher and picking plant. During the initial periods, the mines namely I Quarry, II Quarry, III Quarry which were operated. After that, ALS mines and PPLM mines are operated.

The ALS (HSL Pit) is located at a distance of 200 metres from ALS mines office, which is located at 2km from the factory.

Primary Crusher and Picking Plant

Limestone, after being blasted, is crushed as it is in the form of boulder up to 1.2 sq. Meters. This is dumped into dump hopper and pushed into the single rooter impact crushed. Its rated capacity is 600-1200 MT per hour.

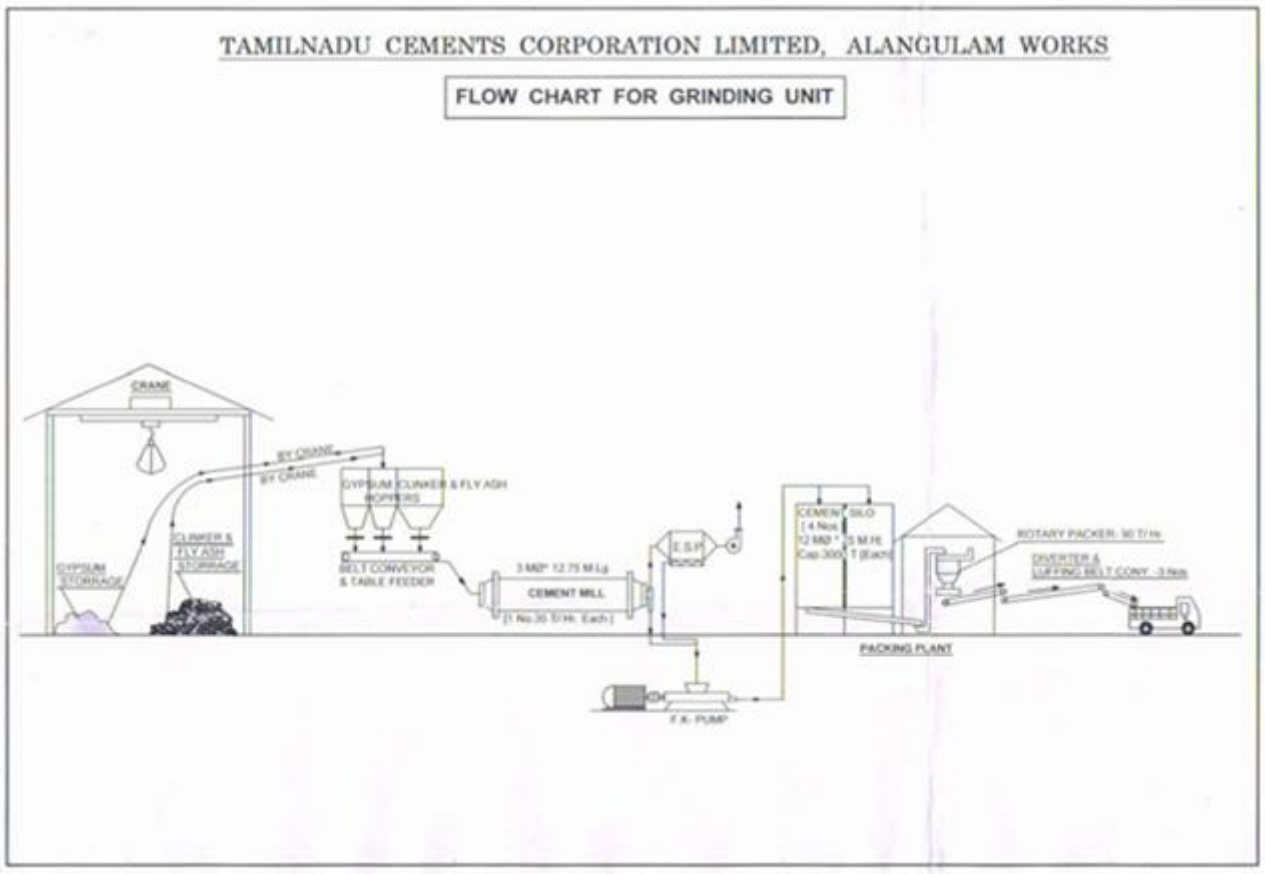
The Primary Crusher and Picking Plant crushes the limestone received from the mines in two stages to the required size and purify by removing the unwanted materials granite stone and earth material.

The primary Crusher is of one number Double toggle Jaw crusher type with a crushing capacity of 325 tonnes per hour, supplied by L&T. the maximum feed size of 1.5 X 1.2 metre limestone boulder is crushed in to 250mm size.

Secondary Crusher is of one number single Rotar Impactor having crushing capacity of 250 tonnes per hour, supplied by L&T. The feed size of 250mm is crushed in to 25mm size and is stored in 4 No storage buckers each having capacity of 60 tonnes and transported to plant through Tippers.

RAW Mill

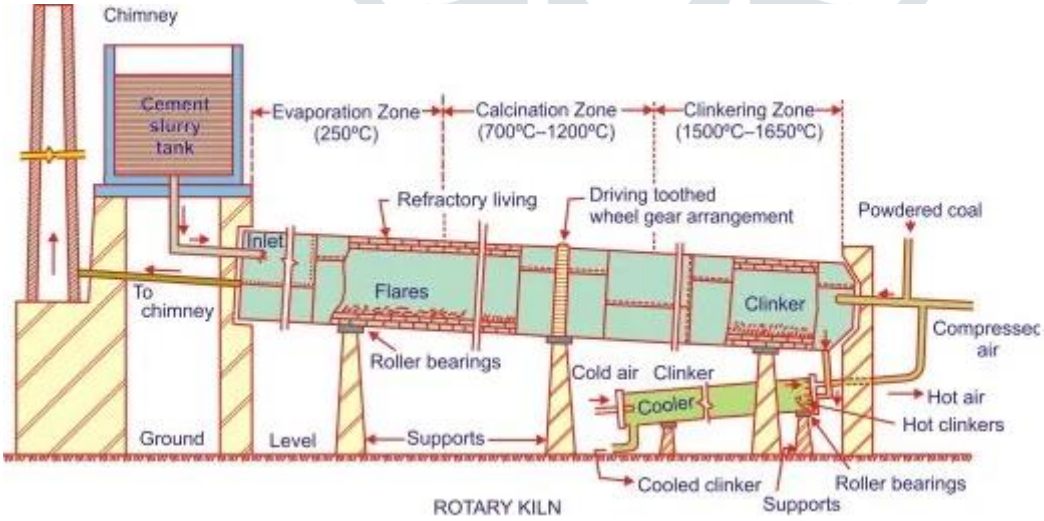
The received Crushed Limestone powder is fed in to the Raw Mill along with 33% of water, where it is ground to the required fineness and comes out as **Slurry**. The slurry is taken to the mixer basin through silos, where it is stirred well by compressed air for getting homogenous mixing of different grade slurry to obtain kiln feed slurry quality of around 75% TCO_3. This slurry is pumped to Ferris wheel feeder to feed in to the kiln.



Rotary kiln.

The Kiln is a main production unit, where the slurry is burnt and CLINKER is produced. The Technical specification of the Kiln are

Type	: Rotary Kiln wet process)
Size	: 3.75m dia x 3.4m dia x 3.75m dia x 135m long
Supplier	: KCP Limited
Capacity	: 630 TPD per Unit
No. of piers	: 6
Kiln Slope	: 2^0
Drive	: 220 HP DC / 0-1000 rpm
No. of Units	: One



The slurry fed in the Kiln is burnt in to clinker with the heat produced by injecting pulverized fine coal for continuous firing and maintaining temperatures at various zones. The hot clinker coming out from kiln gets cooled, while passing through grate cooler where cold air is passed through cooler grates.

Clinker cooling, crushing and storage:

The hot clinker coming out from kiln is cooled slowly by means of air provided by fans. This clinker is crushed in clinker crusher and then stored in storage yard with help of deep bucket conveyor.

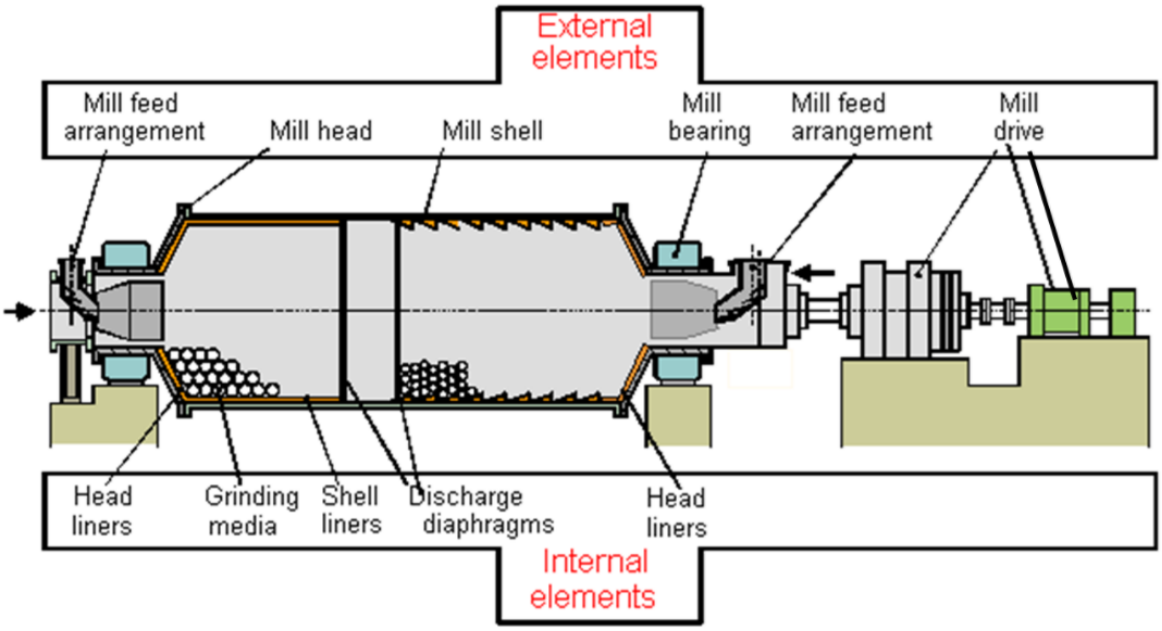
Cement Mill:

The crushed clinker is taken into the clinker hopper in cement mill where it is added with gypsum and fly ash from their hoppers with the help of weight feeders. The mixture is then taken to the bell conveyor and fed on to the ball mill. Two H.T. motors rotate the ball mill. It contains metal ball mill of various sizes like 40mm, 60mm, 70mm, etc. The mill rotates and hence the mixture of clinker, gypsum, and fly ash grinds in the mill. The fly material is taken out from the mill by creating an air drought. This the final product cement stored in storage vessels known as cement silo.

The Cement Mills are the most vital production unit, where cement is produced by grinding clinker required additives of fly ash and gypsum.

The technical specifications of the cement mill are

Type	: Open circuit Ball mill
Size	: 3m dia x 12.75m length in 3 Compartments
Capacity	: 35 TPH
Supplier : KCP Limited Drive	: 1500 KW / 1000 rpm
No. of Units	: Two



For grinding Ordinary Portland Cement (OPC) a mixture of 95% clinker and 5 % Gypsum is fed in to the Mill, whereas for grinding Portland Pozolana Cement (PPC) a mixture of 60% Clinker, 35 % Fly ash and 5% Gypsum is fed in to the Mill. The Cement discharged at Cement Mill outlet is conveyed to Cement storage silos with the help of FK Pumps. The venting of Mill is passed through Cyclonic separators and Electro Static Precipitator (ESP) to the stack.

Cement Storage Silos

There are 4 Nos of identical RCC Storage Silos of 12m dia x 20m height and each having storage capacity of 3000 MT of Cement.

Packing plant

Packing plant is the final stage of the cement manufacturing. The bulk Cement stocked in Cement Silos are extracted and packed in Polythene / Paper bags of 50Kgs. in net weight in the Rotary Electronic packer. The packer machine is used to fill the cement bags. When the cement weight of 50kg is filled in the bag, the bag falls automatically in the conveyer belt. The conveyer belts transfer these cement bags from packer to either truck or wagon directly. Also, there is facility to load the bulk cement into bucket tanker truck, which carries the bulk cement to the port from where it is exported abroad.

The Technical specification of Rotary Electronic Packer are given below

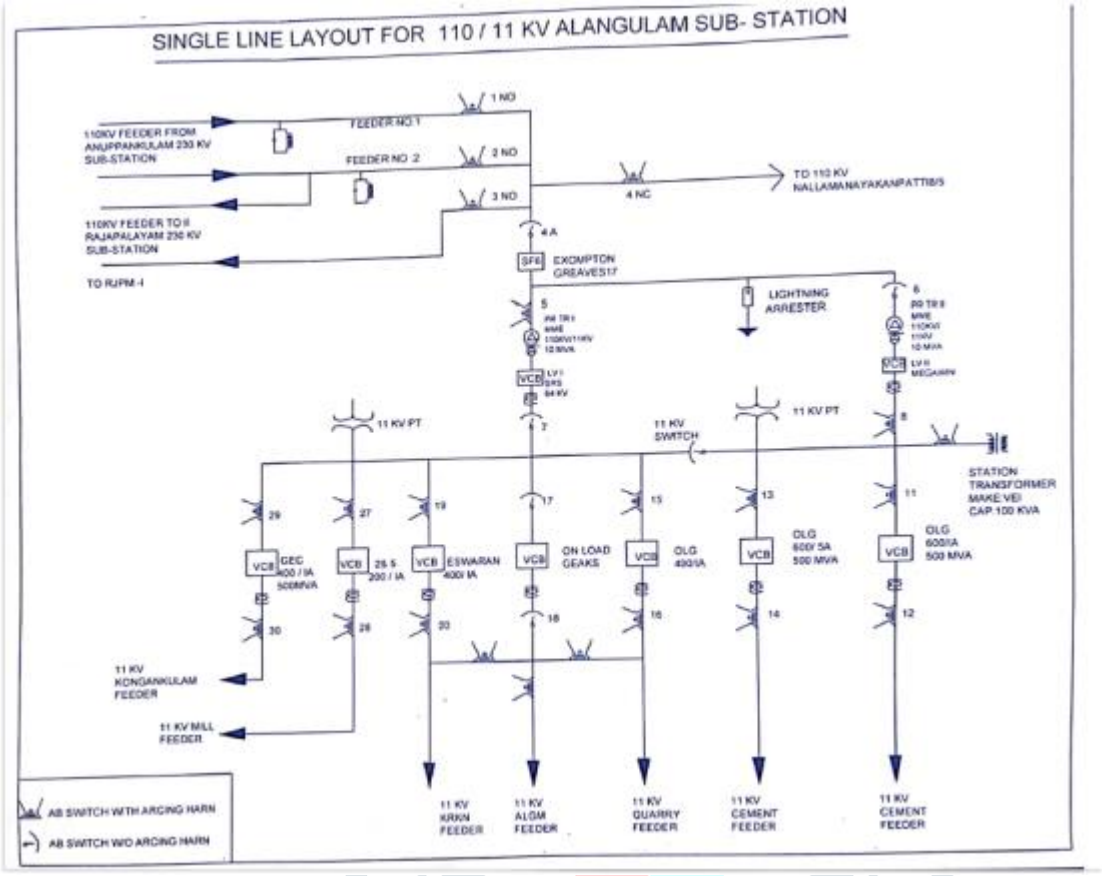
Type	: BRS-E Single Discharge
Make`	: FLSmidth
Year	: 2013
Capacity	: 90 TPH
Load	: 34.5 KW
No. of Units	: One

SIMPLE ELECTRICAL SYSTEM OF ALANGULAM CEMENT FACTORY

Sanctioned Maximum demand is **2970 KVA**

Transformer capacity =**4 Transformer X 1500 KVA**

EB Supply incoming single line layout

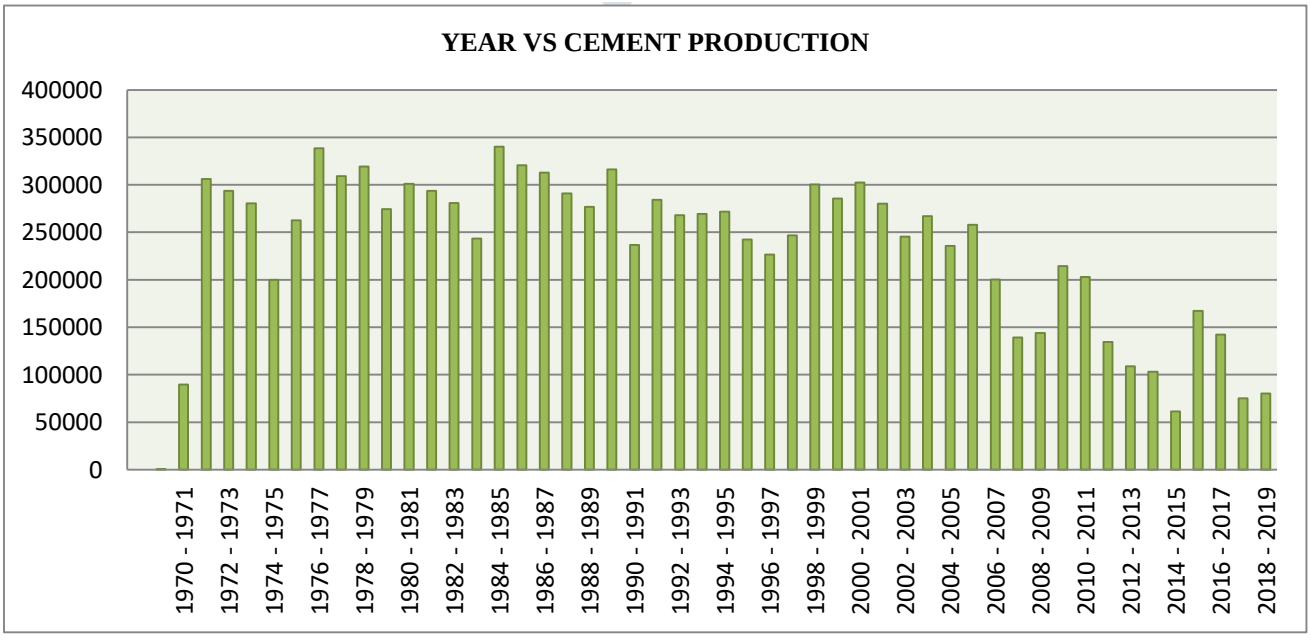


Now the plant is running with simple system of manufacturing Cement with 2 Cement Mills only each Cement Mill is coupled with 1500KW synchronous motor.
The synchronous motor initially started as slip ring induction motor with 5 steps of rotor resistance.
Each and every step of resistance is reduced with Timers after 5th (last) resistance dc supply fed to the rotor winding.
This dc supply generated from the dc generator which is also coupled with the cement mill synchronous motor.
DC exciter voltage is 28.5 V with 600A.

PRODUCTION Details at M/s Alangulam Cement works

YEAR	CLINKER in MT	CEMENT in MT	CAPACITY OF UTILISATION (%)
1969 - 1970	16,183	811	-
1970 - 1971	135,231	89621	39
1971 - 1972	273,816	306158	77
1972 - 1973	249,753	293525	73
1973 - 1974	258,140	280382	70
1974 - 1975	189,110	200070	50
1975 - 1976	254,412	262729	66
1976 - 1977	326,021	338445	85
1977 - 1978	286,890	309105	77
1978 - 1979	297,040	319305	80
1979 - 1980	249,050	274400	69
1980 - 1981	267,561	301148	75
1981 - 1982	274,102	293515	73
1982 - 1983	232,251	280750	70
1983 - 1984	209,474	243445	61
1984 - 1985	293,413	340030	85
1985 - 1986	280,575	320672	80
1986 - 1987	266,918	312741	78

1987 - 1988	247,337	291009	73
1988 - 1989	254,500	276725	69
1989 - 1990	273,840	316130	79
1990 - 1991	229,189	236765	59
1991 - 1992	247,249	284213	71
1992 - 1993	238,522	268041	67
1993 - 1994	240,600	269413	67
1994 - 1995	238,562	271809	38
1995 - 1996	210,679	242404	61
1996 - 1997	190,331	226594	57
1997 - 1998	161,684	246725	62
1998 - 1999	262,704	300378	75
1999 - 2000	181,347	285558	71
2000 - 2001	216,602	302496	76
2001 - 2002	196,296	280156	70
2002 - 2003	118,288	245376	61
2003 - 2004	149,101	267020	67
2004 - 2005	124,170	235670	81
2005 - 2006	134,275	258025	89
2006 - 2007	114,101	200140	69
2007 – 2008	90,005	139195	48
2008 – 2009	115,455	143895	50
2009 – 2010	165,565	214505	74
2010 – 2011	163,866	203040	70
2011 - 2012	106,661	134640	46
2012 – 2013	87,656	108870	41
2013 – 2014	70,975	103253	36
2014 – 2015	42,560	61190	21
2015 – 2016	119,196	167154	58
2016 – 2017	101,760	142105	49
2017 – 2018	0	75260	28
2018 - 2019	0	80235	28



Cement Products of TANCEM

Cement

It manufactures and supply 33 Grade Portland Pozolana Cement (PPC) in the brand name of "Arasu Super Star".

MARKETING ACTIVITIES

Tamilnadu Cements Corporation Limited, a State Government undertaking, is manufacturing high quality Arasu Super star Brand cement of PPC, OPC 43 Grade and OPC 53 Grade as per B.I.S. in their two factories. The cement manufactured by TANCEM is being used by both Government Departments and general public through private Stockist. A number of Government buildings such as Collectorates, TNHB Towers, Shopping complexes, Bridges, Power plants, etc. have been constructed exclusively using "Arasu Cement". "ARASU SUPER STAR" is the most liked and reputed brand among public.

Some of the important constructions where Arasu cement was used.

1. Anna Fly Over, Chennai. (Constructed during 1973)
2. TNHB Shopping Complex, Anna Nagar, Chennai.
3. TNHB Tower Block, Taylor's Road, Chennai.
4. Napier's Bridge Extension, Chennai.
5. North Chennai Thermal Power Plant, Ennore.
6. Thalamuthu Natarajan Buildings, Chennai.
7. Number of new buildings for various collectorates like Thiruvannamalai, Dindigul, Vellore and Villupuram.
8. Vellore Court, TANCEM supplies cement to Government Departments and also to General public through its Stockists' network. TANCEM markets cement not only in Tamil Nadu but also to Kerala.

PROPOSAL FOR REHABILITATION WORKS OF ALANGULAM CEMENT FACTORY

Alangulam Cement Factory was commissioned during 1970 producing cement by "WET PROCESS". Due to long run operation of the factory and due to aging of machineries, the unit is unable to operate the Plant with efficient manner. Due to the above reason, the production efficiency is getting reduced and increasing the production cost.

Based on the inspection the following Rehabilitation works has to be done

- Reconditioning of Raw Mill
- Changing of Kiln shell to a length of 23.05m to adopt Dry Process
- Repairing of ESP ducting &casing including thermal insulation.
- Installation of Mechanical Conveying System
- Repairing works in Cement Mill I and Cement Mill II
- Repairing Dumpers

The approximate Estimate for the above said works is Rs. 7.00 Crores.

By carrying out the rehabilitation works, the following immediate benefits may be achieved.

- Increasing the Raw Mill productivity by which the electricity consumption can be reduced.
- In Kiln, changing of 23.05m length will increase the productivity by which the variable cost for coal, power, spare parts and firebricks for producing clinker can be reduced.
- As per the direction of Tamil Nadu Pollution Control Board, while the Kiln is in operation, we can operate the ESP, control the dust and protect the environment.
- Conveying the cement through Belt conveyors (Mechanical Conveying System) from Cement Mill to Cement Silos, the power consumption for producing one tone of cement can be reduced to 5 units. The expenditure towards the cost of spares and maintenance can also be controlled.
- By attending to the repairing work in Cement Mill II, the productivity can be increased.
- By attending to the repairing work and the quantity of limestone transported from the Mines to the Plant can be increased.

CONCLUSION

By completing the above works, the Plant will be run efficiently with a payback period of 3 years. After implementation of the Rehabilitation works the following expenditure can be reduced.

Sl. No	Description	For producing one tone cement		
		Present expenditure incurred	Anticipated expenditure to be incurred after completion	Profit on expenditure in cement production
1	Electricity	105 Units	94 Units	Rs.88.00
2	Coal	31%	30%	Rs. 30.00

By Completing the rehabilitation works at Alangulam Cement Works, the Plant can be operated efficiently.

I. ACKNOWLEDGMENT

Hereby we Sincerely thanks Mr . K.MARIKANI , Unit Head / General Manager, M/s **TAMILNADU CEMENTS CORPORATION LTD** for giving this wonderful opportunity to undergo Industrial Training at Alangulam Unit, Tamilnadu.

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