Benchmark plant completion

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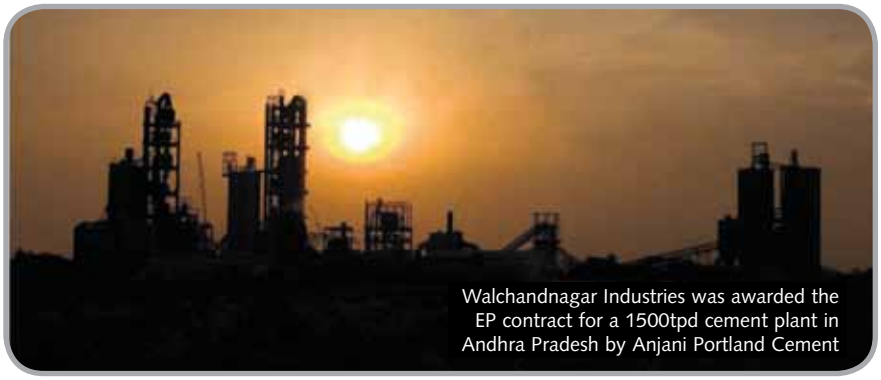
In August 2008, Walchandnagar Industries Ltd (WIL) was awarded the EP contract for a 1500tpd cement plant in Andhra Pradesh, India, by Anjani Portland Cement Ltd (APCL). Its schedule to commission the plant within 18 months from the initial order, was a key challenge. However, with the consistent effort and co-operation between APCL and WIL, this was achieved in record time, creating a benchmark for cement plant completion. WIL describes how the project was achieved.

Located in a very hot and humid location, Anjani Portland Cement's plant is situated approximately 200km from Andhra Pradesh's capital city Hyderabad. WIL supplied all the equipment for the 1500tpd works, including ball mill technology for raw material grinding, coal grinding and clinker grinding. The ball mills are designed by WIL, following previous technical collaborations with Polysius (1969-79), while the five-stage preheater and precalciner benefits from WIL's experience gained during its 23 years' extensive technical collaboration in with Onoda, Japan (1985-2003).

The complete electrical system from the switchyard onwards was supplied by WIL and included the entire instrumentation with Siemens latest software and distributed control system (DCS). APCL contracted the erection and construction of the cement plant to well-experienced and well-known local contractors.



Walchandnagar Industries was awarded the EP contract for a 1500tpd cement plant in Andhra Pradesh by Anjani Portland Cement

Raw material preparation

All quarries that supply raw materials, such as limestone and iron ore, to APCL's cement works are located 8-10km from the plant. A two-stage crushing and screening system was selected to ensure the raw material size of 8-10mm for the ball mill grinding operation.

The 5000t limestone storage stockpile and 1000t iron ore stockpile were planned as a linear tripper belt conveyor arrangement. Each stockpile has its own underground extraction arrangement to facilitate automatic raw material extraction.

Raw material grinding

The raw materials are transported from the stockpile to the 475t capacity feed hoppers at raw mill inlet. The high abrasiveness of the raw mix was crucial in determining the ball mill technology to be used. To facilitate raw grinding a high-efficiency dynamic separator technology of Sturtevant design by Belgium-based Magotteaux was selected. WIL has ongoing technical collaboration with Magotteaux for high efficiency separators. The main characteristics of the trunnion bearing ball mill are shown in Table 1.

Given that the raw material moisture is very low, no additional external drying system is required. Raw materials are dried inside the raw mill using the preheater hot gasses produced.

Clinker operation

The 5000t blending silo is fed by a belt-type bucket elevator which collects the raw meal from the ball mill. From the silo, the raw meal is transferred to a single-string, five-stage preheater and a precalciner, both of which are based on Japanese Onoda technology. WIL has been able to successfully demonstrate

WIL's manufacturing facility near Pune, India

.... about Walchandnagar

Walchandnagar Industries Ltd (WIL) is one of the leading Indian companies for the design, engineering, manufacturing, erection and commissioning of cement plants and machinery, with experience spanning 45 years. In the last six years, the company has expanded its presence in the turnkey cement market in India and abroad. WIL has successfully commissioned four cement plant projects and two grinding units on a turnkey EP basis in recent years.

The 1500tpd for Anjani Portland Cement Limited (APCL), is WIL's fourth turnkey project to be commissioned. The cement plant was executed in 18 months from the date of ordering and has achieved 20 per cent higher capacity than the guarantee figure.

Table 1: trunnion-bearing ball mill characteristics

Type of ball mill	End-discharge close-circuit ball mill
Size of ball mill (ϕ m x length m)	3.8 x 13
Nominal capacity (tph)	100
Separator model	SD-100
Separator air volume (m^3/h)	170,000
Nominal product fineness at 15% R (μ)	90
Installed power (kW)	2 x 1350
Mill operating capacity at 18% R90μ (tph)	130

Table 2: cement grinding mill characteristics

Type of ball mill	End-discharge close-circuit ball mill
Size of ball mill (ϕm x length m)	3.8 x 13
Nominal capacity (tph)	80
Separator model	SD-100
Separator air volume (m^3/h)	150,000
Nominal product fineness at OPC Blaine (cm^2/g)	3000
Installed power (kW)	2 x 1350

Table 3: clinker operation

Type of preheater:	five-stage, single-string with precalciner
Cyclone diameters (m):	stage-I: 2 x 3.37, stage-II to V: 5
Ph fan (m^3/h):	245,000 static pressure -700mmWG (VFD drive)
Size of rotary kiln (m):	ϕ3.2 x 48
Maximum speed (rpm):	5
Drive power: (kW)	150 (VFD drive)
Clinker cooler:	grate cooler with WIL design fixed static inclined grate
Cooling area (m^2):	41
Cooler efficiency achieved (%):	72

that the performance of the precalciner is on a par with the latest technology available on the market.

The selected three-pier ϕ3.2m x 48m kiln includes a girth gear drive and very efficient lamella seals at the kiln outlet and pneumatic seal at kiln inlet.

The clinker cooler is a conventional grate cooler with a fixed static inclined grate. It has an effective cooling area of $41m^2$ which enables to recuperate the maximum tertiary air to the precalciner from the cooler. The efficiency achieved from the grate cooler is 72 per cent. A multichannel kiln burner is employed to ensure efficient mixing of air and coal for burning.

Cement grinding and packing

Clinker is transported from the cooler by a deep pan conveyor to a stockpile with a 25,000t storage capacity. The clinker from the stockpile is extracted by 11 motorised clam gates and transported further to the cement grinding mill feed hoppers by heat-resistant belt conveyors.

Additives such as gypsum and fly ash are used to produce OPC and PPC cement. The capacity of the fly ash storage silo is 500t. The dry fly ash is transported by bulk tankers to the plant and then pumped to the silo pneumatically. The fly ash flow rate at discharge is metered with solids flow meter.

WIL has received extensive co-operation from APCL during execution of the project, which along with continuous efforts, engineering and manufacturing expertise as well as more efficient project management of WIL helped to realise the 18-month project completion benchmark

The cement is stored in two inverted-cone cement storage silos with individual capacities of 5000t. The cement is then packed in 10-spout packers with a bagging capacity of 3000 bags/h. Two truck loading stations facilitate loading of open and close trucks from the top and rear. Two truck loading machines with a 2000 bags/h capacity are provided with the option of adding two loading machines in the future.

Project planning and execution

WIL carried out extensive planning along with APCL to achieve the commissioning target of 18 months. The major governing factor for the timeline was civil works for major structures such as the preheater, kiln and silos. Within a month, WIL had completed the engineering of major sections, which included key civil work. This enabled APCL to design the building and start the execution of civil work in the second month. Also, WIL manufactured all the core machinery such as ball mills for raw material, coal and cement grinding, rotary kiln and grate cooler in its state-of-the-art manufacturing facility near Pune, in a record time of 10 months. This enabled the starting erection of the long lead equipment much earlier.

WIL received extensive co-operation from APCL during project execution which – along with continuous efforts, engineering and manufacturing expertise as well as more efficient project management of WIL – helped to realise the 18-month project completion benchmark. This is a classic example, where the owner and the contractor have worked together to achieve project completion on time.