

Developments in Iran

Dr M. Rahim Vaseghi, Islamic Azad University, Shiraz, Iran, follows the growth of the Shahrekord plant in relation to the Iranian cement industry.

Introduction

Twenty years ago, at the beginning of a post-war era, authorities in Iran decided that a cement plant was needed, initially to provide materials for the construction of dams, as the country's best water resources were located in Chahar Mahal & Bakhtiari, a province in the centre of the country, and most of them were going to waste.

At the time, most projects were undertaken by Ehdas Sanat, a governmental engineering company, and so they were selected for the construction of the Shahrekord plant. Initial capacities were considered to be 500 tpd, 700 tpd and 1400 tpd, however, no practical steps were taken until 2004.

The Shahrekord cement plant is located 30 km from Shahrekord, the capital of the province. It is the first cement plant in the state, with a





Key members of the project celebrating the start-up of the plant.

capacity of 3300 tpd, although it is thought that the kiln could reach up to 3800 tpd.

Azarab, a company with a background in dams, power plants; oil, gas and petrochemical fields, acted as general contractor (GC) for the project, using local materials for the majority of the construction.

Some details on the plant:

- Product/ capacity: Portlant cement/ 3300 tpd.
- License date: October 2000.
- Land purchase: 2001.
- Fencing and storage construction: 2002.
- Foreign currency budget: €20 million.
- Local currency budget: 1070 billion Rials (US\$112 million).
- Production line machinery: 7716 t.

Table 1. Machinery suppliers for the Shahrekord plant

Equipment	Technology	Capacity / notes
Cement mill	FLSmidth	2 X 120 tph
Cement mill gearbox	MAAG	CPU 38 s
Cement packers	2 X Haver 10 - spout Rotopackers	
Cement silo	IBAU HAMBURG	2 X 10 000 t
Clinker break fan	Novax Axial Flow Fan - York Fans	
Clinker breaker	FLS Spain	Uses Crodur hammers
Clinker mill bodies	HolmingWork (Finland)	130 t weight
Clinker mill media	Iran ZOB Co. Ltd	
Clinker transport	Aumund	300 tph
Compressors	Atlas Copco / Havayar	5 x 25 m³/hour (HY 160)
Control system	Simens / Fars Scout	
Control system	Fars Scout	
Cooler and kiln dedusting	FLSAirtech / JDEVS	
Cooler dedusting	FLSAirtech / JDEVS	< 50mg / Nm³
Cooler fans	Venti - Oelde	
Cross belt analyser	Scantech	
Crossbelt	Scantech	
Crusher	TKF	1000 tph (type MB 56 / 90 With roller Screen)
Crusher crane	Arian Crane Co.	CONE Finland
Drive on crusher	PIV	
Electrical controls	Simens / Fars Scout	
Homogenising silos and kiln feed	IBAU HAMBURG	2 X 8000 t
Kiln drive gear box	Flender	H3SH - 21 28C
Large El. Motor	ABB	
Loading stations	3 X Haver Loading HB17 + 1 HB20	
Packing plants	Haver & Boecker	2 x 3000 bag/h
Preblending	Ciman Sazan	2 x 30 000 t
Pyroprocessing	FLSmidth	3300 tpd
Raw mill	Loesche	300 tph (LM 48.4)
Raw mill	Loesche (VRM)	
Raw mill drive	Flender	KMPS 476
Raw mill gear box and transport drives	Flender	
Silos	IBAU HAMBURG	
XRD	Oxford	

- Foreign machinery: 2234 t.
- Refractory lining: 2400 t.
- Insulation area: 14 000 m².
- Production line concrete: 91 000 m³.
- Steel reinforcement: 12 000 t.
- Steel structure: 6000 t.
- Production line area: 60 000 m².
- Auxiliary building area: 8000 m².
- Excavation operation: 290 000 m³.
- Total land area, including mines: 230 ha.
- Total production area: 135 ha.
- Nominal annual production: 1 million t (3300 tpd).

Start-up

Tender documents were prepared in 2002 and Ehdas Sanat was selected as the EPC contractor. 22.5% of shares were given to Darab Cement plant, and 72.5% belonged to Iranian Social Security Organisation funds (Shasta) and several banks, while local authorities took 5%. By the end of 2002, Azarab was asked to apply its expertise and speed up progress.

With no history in cement, Azarab began to negotiate with foreign suppliers. In 2003, technical documents were confirmed, and in early 2004, Letters of Credit (L/C) were opened and foreign suppliers were chosen. The condition, in most of the contracts, was to maximise the use of local capacities.

Machinery

In 2004, drawings arrived in Azarab workshops, and by mid-2005 the majority of machinery had been built. Of a total 8600 t of equipment, some 6600 t were made locally, leaving only 2000 t to be delivered by foreign suppliers.

Sub-contractors

The GC used its experience from other projects for the selection of sub-contractors, and brought in some powerful companies to work in a harsh environment. Many local people were used in the project, and the project manager believes that many of those that were mere labourers in the initial construction, could play a more significant role in future projects.

Civil work, installation and commissioning

Civil work began in September 2004, working in snowy, winter weather with temperatures of -35 °C, and highs of 45 °C during summer.

By December 2005, installation and erection was undertaken alongside the remaining civil work. Some foundations were ready for installation, and temporary roofs were put in place to protect workers against the weather; even the gasoline in the cranes had to be warmed to stop it freezing.

As the civil work was a year ahead of installation, most of the initial money was absorbed by the construction. As civil work reached its end, and erection was only half way through, a shortage of

money became apparent around May 2006. Facing financial difficulties, the GC tried to facilitate all of its

Table 2. Contractors and consultants employed

Civil contractors	
Department	Contractor
Production line	Khadamat Zir Banaie Company (Subsidiary of Djahad Silos)
Auxiliary building	Behsaz Mahal, Omran Zanjan, Parniyab, Saman Saray Shahab Companies and Hafashjan City Council
Steel structure	Khadamat Zir Banaie, Soleh Tabarestan, Foulad Tadbir, Parto Sazan Espadena and Sanatgarn Sefid Dasht Companies
Main contractors	
Crusher fabrication and installation	Machine Sazi Iran
Preblended stock pile	Siman Sazan
Raw mill installation	Ase Sanat
Preheater installation	Koohrang Sanatgaran
Electrofilter fabrication and installation	Djahad Elm v Sanat
Pyroprocessing installation	Daghigh Kar
Clinker transport system	Machine Sazi Iran
Cement mills installation	Damoun Sanat
Refractory lining	Rahbord Sanat
Insulation lining	Limouchi
Electrical contractors	
Electrical, automation and instrumentation	Fars Scout
Power transport	Hamrah Ofogh
Power transport supports	Bonyad Pousheh
Miscellaneous contractors	
Utility	Pakman
Oil tanks fabrication and installation	Isfahan Machine Manufacturing
Lab shelves	Arvin Tech
Yard improvement	Bonyad Maskan
Extraction and transport of raw materials	Bonyad Maskan
Consultant groups	
Department	Consultant
Main	Modiriat Ehdas
Civil	Daheh
Mine	Bonyad Sanat
Geotechnical	Sano
Electrical	Ehdas Control
Power Transport	Mashanir Engineering Services
Utility	Padidab Consultants



The Loesche raw mill.

technical teams in order to avoid any disruption in the progress.

By the end of 2006, the structure of the shareholders changed. 72.5% of Shasta was given to National Housing Foundation (Bonyad Maskan), and the money generated was injected into the project. The first nine months of 2007 proved tough, as workers had to compensate for the previous delays, but by the end of 2007, the plant was ready for start-up.

It is believed that another company acting as GC may not have been able to cope with this situation, however, Azarab was able to support its personnel during the financial delays. The company owned most of the installation and erection equipment, and some unique methods of erection and installation were deployed that saved the project a lot of money.

Fars Scout made a valuable contribution to the project, in charge of selection, providing and installing electrics, automation and instrumentation. Some of the activities included:

- Engineering documentation e.g. MCC, LV, MV, HV, power cabling, consumer list, PLC IO Allocations, control philosophy, MTO.
- Calculation and purchasing of motors, drives, transformers, MV starters.
- Design, manufacturing, installation and testing

of more than 140 MCC and PLC cabinets, LCS Panel, emergency stop, and junction boxes.

Updates on statistics

Iran celebrated its 74th anniversary of cement production in January 2008, with plans to add 50 million t to the existing capacity (63 million t¹) over the next six years. This would make Iran the 5th largest cement producer in the world, and the first in its region.

The Iranian cement industry produced 650 million t of cement over the last 74 years; this includes 14 million t of imports and 16 million t of export. In the last Iranian calendar year (ending 20 March, 2008), 46 million t of cement was produced in 50 cement plants, using a total of 73 kilns. It should be noted that 9 million t of capacity, planned for the last year, came online gradually between October 2007 and July 2008^{2,3}.

At present, cement consumption of the country is around 650 kg per capita, which is higher than the world average, brought about by the high rate of national development. Since this industry has a significant influence on the national economy, and because of the relative advantages of cement production in the country, there is a plan to boost cement production capacity to more than 95 million t within the next six years⁴.

On the progress of existing projects, the following capacities are expected for the relevant years: 63 million t in 2008, 73 million t in 2009, 78 million t in 2010, 82 million t in 2011, and finally, 95 million t in 2012 – 2014. There are other projects which have not been considered, as they are in the early stages of work.

Existing capacities

The existing cement capacity⁵ of the country is around 63 million tpa, with an overall efficiency of 96.18%. 53 million t is an approximate figure for production this year; this is because some plants have just been commissioned, and it takes time to reach nominal capacity. When the Iranian New Year arrives in March 2009, statistics will confirm how much of this capacity has been realised. The latest information is displayed in Table 3.

Ongoing projects

45 live projects⁵ are underway to bring the capacity of the country to around 50 million tpa. Nine projects have already been commissioned in the last four months, that have added 10 million t to the capacity; and seven projects are in the last



FLSAirtech designed bag filter, made by Azarab.

10% of progress that will add a further 4.6 million t. Statistics suggest that 28 of the projects are in the second half of production, and will add 29.3 million t to the existing capacity. Over the next two years, 39 million t will be added to the projects that were commissioned in the last four months, 10.7 million t will come from projects that are less than 50% complete, and should come online within three years.

Local fabrication scores around 66%. This means Iranian machine manufacturing companies still have gaps to fill, although there has been progress in the last few years, and the supply of certain parts (e.g. electrical components) may not be feasible from local companies.

The average progress of the projects is 74%, and

Table 3. Existing capacities in Iran

Plant	Capacity (tpa)	Production (tpa)	Plant	Capacity (tpa)	Production (tpa)
Abyek	2.34 million	1 934 010	Shahroud	842 400	989 988
Uromia	936 000	1 356 826	Ghaen	811 200	949 104
Isfahan	1 035 840	1 091 361	Kordestan	998 400	1 269 466
Behbahan	717 600	846 481	Saveh (white)	330 000	393 261
Tehran	3 375 840	3 109 486	Niriz (white)	163 800	140 442
Safaieh	624 000		Hormozgan	1 872 000	2 171 707
Doroud	1 244 880	1 153 630	Hegmatan	2 059 200	1 273 821
Khazar	1 248 000	984 422	Karoun	936 000	1 216 332
Sepahan	2 059 200	3 251 065	Uroumia (white)	163 800	214 267
Shomal	1 310 400	484 717	Bojnourd	624 000	854 818
Sharq	1 448 460	1 574 766	Gheshm	240 240	356 852
Sufian	1 485 120	1 429 279	Boushehr	936 000	1 183 946
Gharb	1 248 000	277 805	Darab	1 029 600	1 252 200
Fars	819 000	790 663	Benvid (white)	163 800	161 900
Kerman	1 148 160	1 210 390	Kohkiluyeh	240 240	303 447
Lushan	205 920	118 898	Bohrouk	1 123 200	
Neka	1 653 600	969 175	Kavir Kashan	556 920	676 881
Shomal (white)	89 232	18 462	Fars Nov	936 000	1 150 625
Abadeh	392 120	290 482	Zanjan	606 060	486 181
Ardebil	1 092 000	924 815	Firouzkuh	1 029 600	1 057 193
Estaban	327 600	312 367	Larestan	218 400	184 985
Ekbatan	171 600	197 992	Saveh	2 246 200	2 427 918
Ilam	624 000	671 923	Faraz Firouzkuh	1 060 800	943 476
Khash	811 200	888 264	Momtazan	1 029 600	1 107 644
Khuzestan	936 000	618 790	Ardestan	1 029 600	300 952
			Total	48 590 832	45 573 474

Table 4. Proposals that have already been accepted

Plant name	Capacity	Province	Bank
Kerman (extension)	1.815 million	Bushehr	Melli
Firouzkuh Semnan	1 million	Semnan	Saderat
Sepo	759 000	Kohkiluyeh	Saderat
Esferayen	1 million	North Khorasan	Mellat
Samangan	1 million	North Khorasan	Sepah
Khoram Abad	1 million	Lorestan	Tejarat
Saqez	1 million	Kordestan	Saderat
Basat Rafsanjan	1 million	Kerman	Keshavarzi
Mehran	1 million	Ilam	Melli
Larestan (extension)	1 million	Fars	Saderat
Kavir Asia	1 million	Sisyan V Balouchestan	Sanat v Madan
Tees Chabahar	1.2 million	Sisyan V Balouchestan	Sepah
Kiasar	660 000	Mazanderan	Sepah
Helel Gostar	1 million	Kohkiluyeh	Sepah
Komejyan	1 million	Markazi	Melli
Tangestan	1 million	Bushehr	Sanat v Madan
Total	16.434 million		

most of them should be online on time, as long as no financial issues appear. Aside from the projects that are already underway, there are sixteen proposals waiting for L/Cs to be opened. These proposals will provide a capacity of 16.5 million tpa (see Table 4).

Cement market



The cement mill is prepared for installation.



The rotary kiln, designed by FLSmidth.



The Aumund material transport system, made by Machine Sazi Iran.

The history of cement pricing suggests that the government has always controlled the market in favour of end users⁷. However, due to high demand, the market has always suffered from a lack of cement, which is why the black market has played a vital role in the local market. Before price changes in July 2008, the ex-works price of cement was US\$40, and it was sold on the market for between US\$46 and US\$52. The black market price fluctuated between US\$70 and US\$140, depending on the season.

Investors blame the authorities that control the price of cement for jeopardising their investments, and believe that because of this, private investors may lose interest, and it will encourage the black market. On the other hand, the government believes that if the industry is receiving energy subsidies, price regulations should be obeyed. After four years of debate between the Union of cement producers, it was announced that the price control would be lifted in July 2008, and a committee (consisting mainly of Ministries of Industry and Commerce and the Union of cement producers) would control market fluctuations. In fact, a new price of just US\$50 - 65 ex-work has been put in force by the committee just a few weeks back. The difference in price depends on cement quality and whether it is sold in bulk or bag.

Importing has always been promoted by the government. Cement delivered to Iranian ports is more than double the price of local products. Some statistics suggest 660 000 t were imported in 2005, and 280 000 t in 2006.

Previously, cement has been exported⁹ to neighboring countries, but this has been restricted by the government due to local shortages. Latest statistics suggest that 51 000 t were exported in 2004. Recently, the government has allowed new plants to export a portion of their production to cover bank repayments and other debts. There is great potential to export to Iraq and Gulf countries, due to proximity and low delivery costs.

As different sectors are in charge of imports and exports, and, due to smuggling, statistics are not particularly reliable, however, it is believed that exports and imports do not contribute a major part to the country's total production.

Conclusion

Iran's cement industry has made remarkable progress in recent years. Statistical data indicates that production capacity is heading to 63 million tpa, and with the ongoing projects, capacity could rise to more than 95 million tpa in the next 4 to 5 years. The increasing production of this key commodity will not only add value to the country's GDP, it will be conducive to the expansion of activities in several other economic sectors and sub-sectors. This will make Iran a major exporter of cement^{6,7}.

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Table 5. Ongoing projects and their progress, up to July 2008								
Project	Capacity (tpa)	Local fabrication (%)	Progress (%)		Project	Capacity (tpa)	Local Fabrication (%)	Progress (%)
Abadeh (upgrade)	210 000	75.9	99.0		Naizar Qom	990 000	65.9	53.9
Abyek line 1 (upgrade)	1.5 million	54.9	83.8		Nehavand	990 000	65.8	55.2
Abyek line 2 (upgrade)	2.4 million	56.2	62.6		Omran Anarak	990 000	67.4	100
Ardestan	1.05 million	69.1	100.0		Omran Aria	990 000	76.8	30.0
Azar Abadegan Khoy	1 million	66.4	72.0		Payvand Golestan	990 000	67.3	41.4
Bagheran Birjand	1 million	59.1	57.8		Royal	2.16 million	67.5	36.8
Bojnourd (extension)	1.2 million	66.0	85.0		Saman Gharb	2.2 million	72.9	25.3
Dehloran	990 000	60.0	30.5		Sardar	990 000	69.6	63.2
Faraz Firouzkuh	990 000	62.3	100.0		Sarouj Boushehr	1.65 million	71.7	88.5
Gharb (ugrade)	600 000	65.2	92.0		Sarouj Isfahan	600 000	65.4	91.0
Gilan Sabz	990 000	66.8	27.4		Saveh	2.16 million		100.0
Hegmatan (extension)	990 000	64.4	92.8		Sepahan (extension)	1.2 million		100.0
Ilam (extension)	1.2 million	70.5	62.4		Shahrekod	900 000	70.8	100.0
Jovain	1.2 million	66.3	71.2		Shahrud (extension)	1.2 million	57.8	85.5
Karoun (extension)	1.2 million	74.6	42.9		Sharq (extension)	1.2 million	72.1	79.9
Khazar (upgrade)	600 000	62.7	100.0		Shomal (upgrade)	600 000	73.1	100
Khuzestan (extension)	1.5 million	59.6	77.3		Sufian (upgrade)	1.2 million	57.8	75.7
Lamerd	990 000	63.9	57.1		Uromia (extension)	1.2 million	80.5	26.4
Lar Sabzevar	990,000	66.8	86.9		Zabol	990 000	66.8	62.7
Mazandaran (Extension)	1.2 million	62.3	100.0		Zanjan	600 000	68.9	100.0
Mazandaran (Upgrade)	600 000	61.2	90.0		Zarin Rafsanjan	240 000	34.8	70.1
Momtazan	990 000	68.6	100.0		Zavareh Torbat	1.05 million	74.2	83.4
Naeen	1.2 million	71.7	80.7		Total	49.68 million		