

The Union of Myanmar

Kyangin Cement Mill Transportation Reinforcement Project

Report Date: October 2002

Field Survey: August 2001

1. Project Profile and Japan's ODA Loan



Site Map : The Union of Myanmar



Site Photo :Railway in Kyangin Cement Mill

1.1 Background

Kyangin Cement Mill is located in the west bank of the Ayeyarwaddy River about 240km north from Yangon, the capital of Myanmar. The cement factory expansion project was then undergoing, with utilizing two Yen loans amounting to 9,760 million Japanese yen. After the expansion project was completed, the installed production capacity of the factory was expected to increase from 800 ton/day to 1,600 ton/day. As the capacity of the Kyangin Cement Mill increased, the volume of limestone transportation between the factory and the quarry, which is located in 8.4 km of the factory and the one between the factory and the foreshore at the Ayeyarwaddy riverbank 10 km away from the factory were expected to be doubled. Therefore railway transportation capacity was necessary to be reinforced.

However, Myanma Railways' locomotives and passenger coaches as well as freight wagons were over-aged and they are in need of modernization including facility for operation and maintenance. For instance, railway tracks, which had been constructed during the Second World War with used rails, were so deteriorated and need to be replaced. Signals and communications facilities were also necessary to be updated.

Myanmar had large potential to develop power generation owing to its rich resources of natural gas and hydropower. The government's policy was to utilize them for power generation and minimize consumption of crude oil produced in Myanmar, which could be exported and earn foreign currency. As per that policy, Myanma Railway had a plan to electrify its railway network focusing on the Rangoon Circular Line.

Under these circumstances, the Myanmar government requested for the yen loan to Kyangin Cement Mill Transportation Reinforcement Project to the Government of Japan for the purpose of strengthening the transportation in the factory. In addition, the Myanmar government considered it would be appropriate as a pilot project to learn technology and know-how of railway electrification in the country.

1.2 Objectives

To reinforce the transportation capacity at Kyangin Cement Mill to transport lime stone from quarry to the mill and to transport cement from the mill to the port at the bank of the Ayeyarwaddy connected by the railway (approximately 20km) through procurement of the electric locomotives, open freight wagons, construction of electrification facilities with telecommunication system and rehabilitation of railway tracks

1.3 Project Scope

(a) Purchase of vehicles:

- (i) 4 Electric Locomotives
- (ii) 47 Open Freight Wagons (for raw material transportation)

(b) Electric Facility: Construction of Substation and Overhead Facility

(c) Communication Facility: Installment of Signals and Radio System

(d) Railway Track and Others: Procurement of Rail Connection Machinery; Maintenance Tools

1.4 Borrower/Executing Agency

Myanma Ceramic Industries

1.5 Outline of Loan Agreement

Loan Amount	2,580 million yen
Loan Disbursed Amount	2,580 million yen
Date of Exchange of Notes	July 1982
Date of Loan Agreement	August 1982
Teams and Conditions	
Interest Rate	2.25%
Repayment Period (Grace Period)	30(10) years
Procurement	LDC Untied
Final Disbursement Date	August 1987

2. Results and Evaluation

2.1 Relevance

Kyangin Cement Mill is the largest cement factory in Myanmar and has been a major supplier of the cement that is important construction material widely used for construction of infrastructure facilities: roads, bridges, and building construction. Reinforcement of railway transportation capacity in Kyangin Cement Mill to meet increasing volume of production and material necessary for, as a result of its expansion plan was definitely necessary and a high priority project in accordance with Myanmar's development policy at that time. Supporting the project through Yen Loan, in this sense, was reasonably justified.

In those days Langoon Burma Railway Corporation (now Myanma Railways) had a plan to electrify the Circular Line in Rangoon so that it was understandable that the railway electrification of the railway in Kyangin Cement Mill as a pilot project had been appreciated at the appraisal. However, cooperation or involvement of Myanma Railways was negligible except participation of an engineer of Myanama Railways in the training course held in Japan, therefore the project is hardly considered as a pilot project. Different from the situation at the time of appraisal, Myanma Railways no longer has an electrification plan to implement neither at present nor near future.

2.2 Efficiency

2.2.1 Schedule

The project was planned to complete in 38 months but it took 49 months to complete with 11 months delay. Procurement of electric locomotives was delayed in particular, it was caused by mismatching of timing between shipping and manufacturing process. The marine transportation company of Myanmar was designated as a shipping agent for the project, which had only one shipment every three month. Once missed a shipment, it resulted in three months delay and eventually the procurement period delayed half a year. Other than that, no substantial delay of the project was seen and the project was implemented smoothly.

2.2.2 Cost

There was a slight cost overrun and under run among project items: rolling stock (electric locomotives and open freight wagons); electricity facility; signals and telecommunications facility; and railway track replacement, but as a whole the project was implemented within the estimated project cost.

2.2.3 Implementation Framework

During the course of project implementation, consultation was made with Myanma Railways but the staff of Ceramic Industry Corporation and Kyangin Cement Mill played the major role for implementation and carried out procurement, installment, test run and achieved to start operation.

Since the project was the first railway electrification project in Myanmar, staff of the mill and Myanmar Railway was sent to Japan and attended the training course. Four staff members (three from the factory and one from Myanma Railways) received training for operation of telecommunication and signal facility, two for operation and maintenance for electricity facility (operation and maintenance of substation), and four for driving, operation and maintenance of electric locomotives. In addition, the contractors of each component sent totaling 30 engineering staff members to Kyangin and they supervised construction and installation of the facilities and giving instruction and training for operation and maintenance of electric locomotives.

No serious problem was seen during project implementation and it can be evaluated that the project was implemented efficiently.

2.3 Effectiveness

2.3.1 Operation of Electric Locomotives

The electrified railway strengthened in this project is now used only for the raw material (limestone) transportation between quarry and the cement factory. As it is described above, the volume of limestone transportation was approximately half of the planned volume. Operations of electric locomotives are 3 to 4 trips per day, compared with planned 6 to 8 trips per day. Judging from operation trips, it seems expected effect has not been realized. Record of locomotive operation hours had been written by hand on diagram papers which informed approximate time of departure and arrival between quarry and the mill but no detail records were available so that exact operation time cannot be traced. Operation distance has not been recorded since recording papers supplied by the contractor was run out.

Diesel locomotives have carried out the cement transportation between the factory and the foreshore, and electric locomotives are not used. The electrified railway was used for transport of cement for a while after project completion in 1986. One of the four electric diesel locomotives purchased under the project was damaged by the accident in 1991 and since then the factory has not used electric locomotives for the product transportation. The accident occurred due to operation mistake and derailed at cement loading area, and front body (electrical parts) was crashed. After the accident in 1991, the factory has been using one of the remaining three locomotives for the limestone transportation and one for shunting, and the other for stand-by

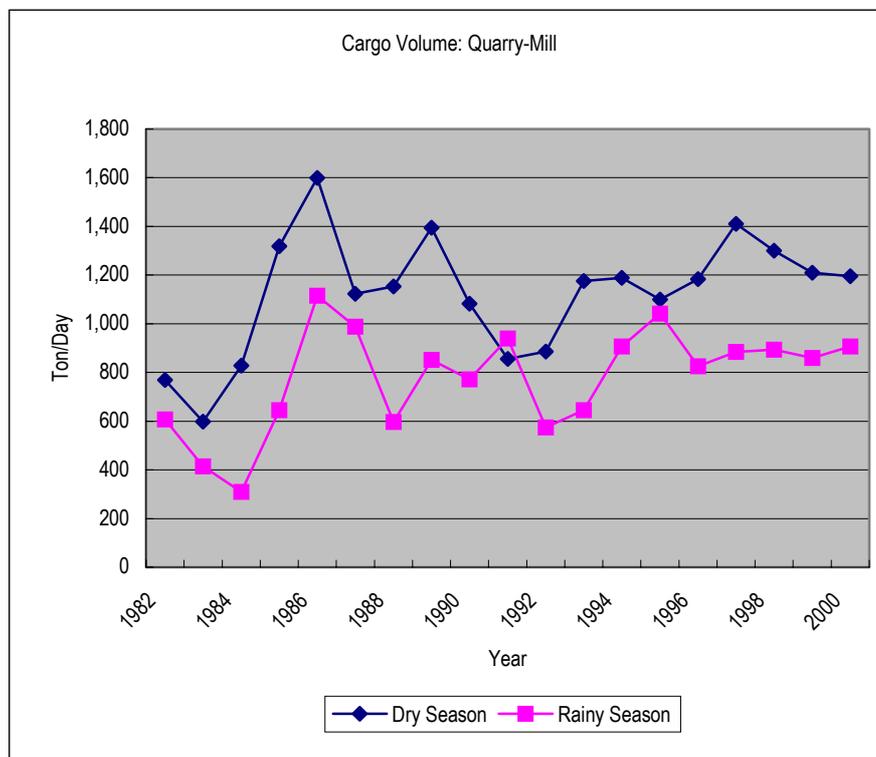
(check and maintenance).

2.3.1 Limestone Transport Volume

The limestone transportation between the quarry and the cement factory was estimated 2,820 ton/day in the dry season and 1,660 ton/day in the rainy season.¹ Estimated cement transportation between the factory and the foreshore was 1,600 ton/day both in the dry and the rainy season. The planned transportation volume in rainy season was lower than in the dry season as efficiency of excavation at the quarry in the rainy season was considered to be lower than the dry season.

The average transport volume of limestone per day in the dry season was recorded 1,599 ton in 1986 and it has been around 1,200 ton/day since then. That of the rainy season was recorded 1,115 ton/day in 1986 and it has been slightly over 800 ton/day since then. After the project completion in 1986 (the volume of 1986 was counted half for calculation, for the completion was in October, the middle of the fiscal year), the average transport volume of limestone is 1,176 ton/day in the dry season and 844 ton/day in the rainy season, which accounts for 41.7% and 50.8% of the planned transport volume respectively.

Figure 1: Limestone Transport Volume



(Source: Kyangin Cement Mill)

2.3.3 Cement Transport Volume

The average volume of the product transport has been almost same level both in the rainy season and the dry season, which is, after year 1986, 690 and 720 ton/day respectively. It accounts for 44% of the planned volume. (See 2.3.4.)

2.3.4 Cement Production Volume of Kyangin Cement Mill

In 1984, cement production fell into 120,000 ton/year but it was recovered up to 300,000 ton/year in 1986 owing to completion of capacity expansion project. Production volume fell again and had been kept over

¹ The dry season sets in November 1 and ends May 14, the rainy season starts May 15 and ends October 30.

200,000 ton/year level for a while. Last 5 years it went up to nearly 300,000 ton/year level and occasionally reached for 300,000 ton/year.

In the late years, production level has been going down due to the aged facility so that Kyangin Cement Mill is now implementing the renovation project with the loan from the supplier, which was expected to complete in October 2001. The renovation includes the reinforcement of excavation capacity in the quarry, rehabilitation of kilns, which covers all the operation of the factory. The factory expects the production level will recover by 80% of its installed capacity.

The cement production volume has been 700 ton/day compared with its installed capacity of 1,600 ton/day (44% of capacity). Although the project aimed to reinforce railway transportation capacity to meet the increased cement production as well as supply of limestone, the railway has not been fully utilized because of low cement production level.

2.3.5 Effect of Railway Replacement

After railway track was replaced by the project, derailment accident in this line disappeared. But 15 years have already passed since the project completion and track condition has been getting deteriorated. Maintenance and rehabilitation of railway track will be important.

2.3.6 Know-How of Electrified Railway Operation

At the stage of project preparation and the training, collaboration was made between Myanmar Railways and the Kyangin Cement Mill. However, once implementation started, construction of electricity facility, installation of equipment, procurement of electric locomotives and test run as well as operation and maintenance were all done by the factory staff. There has been no active collaboration with Myanmar Railways since operation of the electrified railway started. No supports of operation and maintenance or staff exchanges were made. Knowledge and know-how of railway electrification stays only in the factory.²

Nine (9) staff members were dispatched from Kyangin Cement Mill to Japan and received the training. Those nine persons became the core to train other staff in the factory. But now out of nine staff members, seven left the factory and there remain only two persons who had training in Japan. Therefore the factory's concern now is how long knowledge and know-how of the electrified railway operation can be sustained.

2.4 Impact

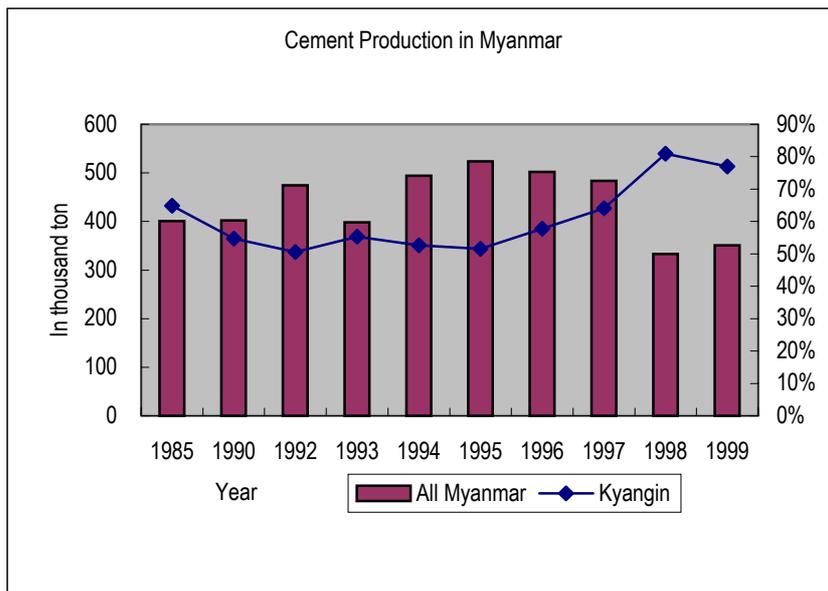
As for cement production of Myanmar, there are Kyangin Cement Mill and another factory, which are under control of Myanmar Ceramic Industries. In addition to these two factories, the new factory is now under construction and will commence operation in 2002. Other than factories run by Myanmar Ceramic Industries, a cement factory with a large production ability of Myanmar Economic Corporation (MEC)³ produces cement 800tons/day. Another factory of MEC with the production level of 4,000tons/day is now under construction by the joint venture of MEC and Japanese company.

Kyangin Cement Mill has been a leading cement factory to supply cement to the domestic market for nearly 20 years. Its share in the domestic market has been at least 50% and sometimes it dominated 80% of the market. The factory has made a large contribution to the development of domestic infrastructure in Myanmar.

² Myanmar Railways had a electrification plan of the Circular Line in Yangon and research for the project was implemented. However, the plan has not been realized.

³ a holding company run by the military capital.

Figure 2: Cement Production of Myanmar and Kyangin Cement Mill



(Source: Kyangin Cement Mill; Statistical Year Book 2000)

Kyangin Cement Mill is the most stable cement supplier in the country, compared with other cement factories with fluctuation of production volume year by year. In late years a consumption of cement has increased rapidly with economic growth of Myanmar. Notwithstanding Kyangin's efforts, domestic cement production is not able to cover the demand so that importing cement from overseas became common situation in Myanmar. (See Table 1.)

Table 1: Cement Production and Imports in Myanmar

(Unit: in thousand ton)

	1985	1990	1992	1993	1994	1995	1996	1997	1998	1999
Kyangin	260	220	240	220	260	270	290	310	270	270
Other Mills	141	182	235	178	234	254	212	173	64	81
Import	2	2	75	140	216	285	590	1047	346	416

(Source: Kyangin Cement Mill; Statistical Year Book)

2.5 Sustainability

2.5.1 Operation and Maintenance

2.5.1.1 Electric Locomotive

Three (3) locomotives are currently working. All the three locomotives are well maintained and utilized for the limestone transportation. Locomotive Operation & Maintenance Department is the section in charge. In this department, 90 staff members are assigned to operation and maintenance for electric locomotives as well as diesel locomotives. Out of 90, 34 are working for diesel locomotives.

Periodic maintenances are carried out daily, monthly, and semi-annually. Overhaul is done once a year. The factory spends six weeks for overhauling the driving part (bogie, axles and wheels) and electric and mechanical part.

There is a record for operation but only recorded running hours. Maintenance record is also kept in a service diary, but it is not detail enough to understand what was done for maintenance. In addition, sometimes

records are lost due to deterioration of the papers. Though any serious problems have been experienced for railway operation, there is a room to improve recording of operation of maintenance. All the record including inventory of spare parts are kept manually.

Kyangin Cement Mill is hoping to repair the unused electric locomotive since an electric locomotive has higher power and can transport raw materials and products with less cost for operation and maintenance. However the lack of foreign currency hinders it from procuring spare parts.⁴

2.5.1.2 Railway Track

51 staff members maintain railway track. Derailment accident disappeared after the completion of the project. However, 15 years have passed after project completion and it was observed curved railway track in several sections. Some other sections of the railway and the ballast under them are covered by grass so that the condition of the railway track cannot be checked. It appears that maintenance of the track is difficult during the rainy season because of the high temperature and humidity in the project area. So far there has been no problem in operation, however, which can be attributed to slow operation speed (less than 20km/h) and light weight of electric locomotives and freight wagons. There is also a room for improvement for track maintenance system.

2.5.1.3 Electric Facility, Signals, Communication Facility

No problem in operation and maintenance for substation, telecommunication, and signals was seen. But overhead facility especially electric wires between the factory and the foreshore have not been in use for a long time. In case where the electric locomotive in the shed is repaired and restarted operation for cement transportation, thorough check and repair will be required.

2.5.1.4 Raw Materials Transportation

At the quarry, the machine excavates the slope and limestone rocks were carried by the lorry to the primary crusher at the site. After crushed into less than certain diameter, they are transported by the belt conveyer to the depot near the railway station and piled there. Limestone laid at the depot is lifted by the belt conveyer again to the hopper and loaded onto open freight wagons through the hopper. A diesel locomotive with the low output (200HP) is used for shunting to organize or adjust a position of the open freight wagons.

Operation of heavy excavator and big lorries is dangerous when the ground becomes muddy in the rainy season. Excavation in the heavy rain is practically impossible. Efficiency of the quarrying work in the rainy season is substantially deteriorated. In order to supply enough raw materials to the factory even in the rainy season, material rocks are excavated as much as possible in the dry season and laid at the depot after primary crushing. Transportation efficiency of limestone in the rainy season becomes low but only slightly compared with the dry season. Transport volume is maintained around 70% of the dry season. Cement transportation in the rainy season and the dry season is almost same volume.

Cement is transported by railway to the foreshore station, from where it is carried by the conveyer to the foreshore, and loaded onto the cargo ship. In late years, water level goes down due to the piles of river sands in the Ayeyarwaddy, and a cargo ship cannot attach to the foreshore in the dry season, where loading cement on the ship is impossible. The factory, therefore, is forced to transport cement to the upper river by the lorries and find the suitable point to unload from the lorries and load onto the ship. Loading and unloading is done

⁴ The other serious factor is that the electricity is not supplied in stable manner. At present, Myanmar suffers from scarce electricity. Yangon and its surrounding area are prioritized in provision of electricity (however, according to the information by the Embassy of Myanmar, the planned water supply restriction is implemented for 8 to 12 hours a day). In other areas such as Kyangin see black-outs quite often which interfere operation of the factory. This situation prevents the factory from relying on only the electric locomotives, forcing it to use both diesel locomotives and electric locomotives.

by a crane, which takes substantial time, manpower and cost while losing efficiency.

2.5.2 Financial Situation

The government purchases all the cement produced in Kyangin Cement Mill. The factory makes operating profit every year but profit margin gets narrow due to increase of operation expense.

Table 2: Income Statement (Last 3 years)

(Unit: in thousand Kyat)

	1998/99	1999/00	2000/01
Operating Revenue	1,207,320	1,129,896	1,244,957
Operating Expense	540,456	688,566	858,678
Operating Income	666,864	438,330	386,279

(Source: Kyangin Cement Mill)

Retained earning has been increased in the balance sheet but long-term liability has not been reduced. In addition, account receivable in the current assets increases rapidly; financial situation of the factory is not in a good shape.⁵ Almost all the cement produced in the Kyangin Cement Mill is, as a matter of form, sold to (第一工業省), however, payment for which is always overdue. Loans in 1998/99 and in 1999/2000 were assistance borrowed in a form of yen loan (three projects inclusive of two separate projects⁶). In 2000/2001 a new (private) loan for the rehabilitation of the limestone quarry and the cement mill was added to Yen loan, thus increased the total amount.

It is expected that Kyangin Mill, which is the largest cement factory, will be able to keep obtaining the financial assistance of the government. However, its financial situation is constantly bad, which can turn to be a factor to hinder the operation of the mill. Therefore the sustainability of this project could be subject to certain constraints

Table 3: Balance Sheet

(in thousand Kyat)

	1998/99	1999/00	2000/01		1998/99	1999/00	2000/01
Current Assets	3,244,639	4,047,328	5,559,364	Liabilities	566,240	720,201	1,633,965
Fixed Assets	580,809	640,032	762,149	-Current Liabilities	207,958	361,919	1,157,899
				-Loan	358,282	358,282	476,066
				-Equity	2,446,108	2,882,408	4,280,056
				-Retained Earning	793,100	1,084,751	1,217,492
Total Assets	3,805,448	4,687,360	6,321,513	Total Liabilities & Equity	3,805,448	3,967,159	4,687,548

(Source: Kyangin Cement Mill)

⁵ Account receivable has been doubled for three periods. (Account receivable in 1998/99:437 million Kyat, in 2000/02 : 1,000 million Kyat. Outstanding collection from the Ministry and local branches in 1998/99 : 253 million Kyat, in 2000/01 : 522 million Kyat) Accounts payable-trade is also vastly swelling. Although it receives subsidy from the government, law level of cash flow prevents the mil from paying the debt including the principal.

⁶ Two Yen loan projects, Kyangin Cement Mill Extension Project : Phase I and II preceded this project.

3. Lessons Learned

4. Recommendations

Comparison of Original and Actual Scope

Item	Plan	Actual
1. Project Scope 1.1 Procurement of Rolling Stock 1.2 Railway Electrification 1.3 Construction of Telecom&Signal Facilities 1.4 Track Rehabilitation	4 Diesel Locomotives 47 Un-Covered Freight Wagons 1 Set 1 Set 1 Set	As planned As planned As planned As planned As planned
2. Implementation Schedule 2.1 Tender and Evaluation 2.2 Rolling Stock Procurement 2.3 Railway Electrification 2.4 Track Rehabilitation 2.5 Completion	Jan.'82-Jan83 Mar.83 July '83-Nov.84 June '83-Sep.'84 Feb'85	Jul. 1983 – Oct.1984 Mar. 1985 – Apr. 1986 Jan. 1986 –Jun. 1986 Sep 1985 – May 1986 Oct. 1986
3. Project Cost Foreign currency Local currency Total Out of which, JBIC Yen loan portion Exchange Rate	2,580 million yen 2,895 million yen 5,475 million yen 2,580 million yen 1 Kyat = 30 yen	2,417million yen N.A. million yen N.A. million yen 2,417 million yen N.A. = N.A. yen