

MOEJ BOCM Project Planning Study in Asian Region (BOCM PS) 2014 Summary of the Final Report

“Saving Energy through the installation of High efficiency Air Jet Loom in weaving field”

(Implementing Entity: TOYOTA TSUSHO CORPORATION)

1. Overview of the Proposed BOCM Project

Study partners	■Mitsubishi UFJ Morgan Stanley Securities Co., Ltd. (hereinafter, MUMSS) MRV methodology creation, technology analysis, business analysis, reporting, and support for research in general ■Japan Textile Consultants Center Technical support, basic planning, technical guidance ■Toyota Industries Corporation Provision of information		
Project site	Shilmandi, Narshingdi, Bangladesh		
Category of project	BOCM Planning Study in Asian Region (BOCM PS)		
Description of project	With respect to the widespread rapier loom in Bangladesh, where the textile industry is thriving, GHC reduction projects related to introducing the energy-saving air jet loom equipment that Japan boasts achieve approximately 70% energy-savings. A cut above in the Bangladesh textile industry, the Mahin Group (hereinafter, Mahin) has raised a variety of management policies toward enhancing productivity, energy-saving, and quality. Mahin's owner Abdullah Al-Mahmud is showing a course of action toward accelerating updated industrialized looms in the Hamid Fabric factory (120 rapier looms to be replaced with 54 air jet looms), to the BOCM project. Mahin is also familiar with Toyota Industries Corporation air jet technologies, and we expect not only for productivity, but also the promotion of business that contributes to greenhouse gas reduction.		
Expected project implementer	Japan	Toyota Tsusho Corporation	
	Host country	Mahin Group	
Initial investment	JPY 393,000 (K)	Date of groundbreaking	September, 2015
Annual maintenance cost	JPY 1,500 (K)	Construction period	7 to 8 months
Willingness to investment	Very strong	Date of project commencement	March, 2016

Financial plan of project	Self-funding: 7-90% (have investment funds through 2014 IPO) Market borrowing: 1-30% (no major difficulties in borrowing)
GHG emission reductions	Alternative power supplied by in-house power generation 1,478 (tCO ₂ /year)

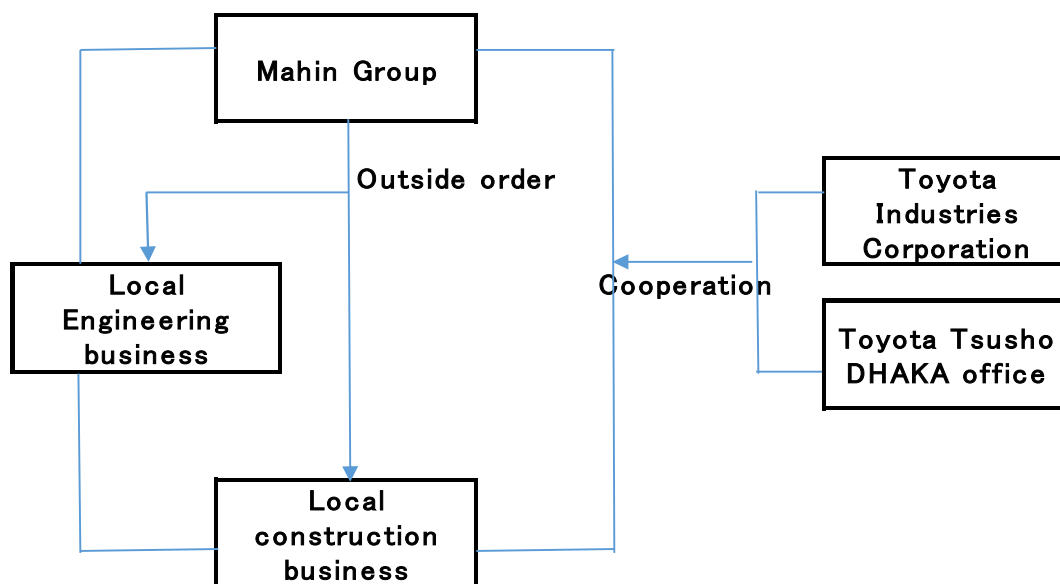
2. Study Contents

(1) Project development and implementation

1) Project planning

The infrastructure construction needed to install the air jet loom equipment is underway through the initiative of Mahin. Mahin is employing a local engineering company to create various plans—such as for loom placement, compressed air piping, electrical paths, and the like. Also as regarding construction, advancing discussions with Mahin toward consigning local contractors with many years of experience is underway.

A supervisor will be dispatched from Toyota Industries Corporation during installation of the air jet looms, with the request for cooperation to ensure that the startup of the equipment goes smoothly. Toyota Tsusho provides support, such as confirming the progress on the construction work mainly by the Japanese resident employee in the Dhaka office and scheduling the dispatch of our supervisor.



Various contracts will be concluded in August 2015 on the assumption of determining employment for BOCM model project. Although the delivery of air jet loom equipment is expected to take six months, this may vary by a few months before or after, depending on the status of Toyota Industries Corporation orders.

During this time, Mahin will take the initiative in implementing compressed air pipelines, electrical construction, air conditioning construction, floor compressor installation, and the like. The rainy season in Bangladesh is from April to September and, with respect to the impact on construction work, we are considering going ahead with basic planning and preparatory work in advance. We considered all kinds of

aspects in this survey, in cooperation with Japan Textile consultants Center, Toyota Industries Corporation, and local engineering businesses.

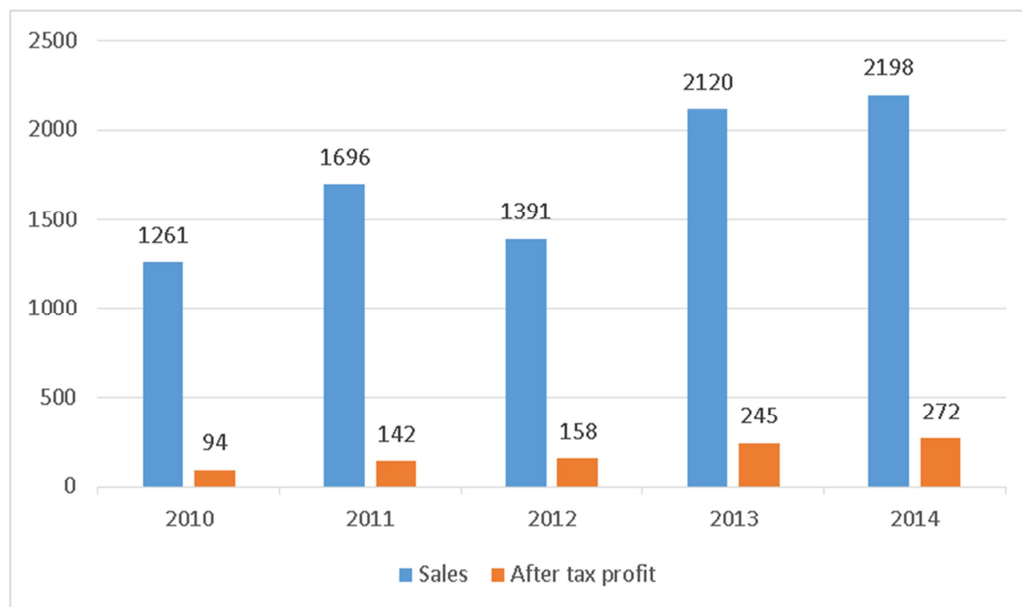
	2015					2016			
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Compressed air pipeline	----->								
Electrical construction			----->						
Air conditioning construction					----->				
Floor							----->		
Compressor installation							----->		
Loom installation								----->	

Mahin was founded in 1993 as a garment industry business. The Hamid Fabric works was founded in 1996, introducing an Ishikawa rapier loom in an effort to expand business in the woven fabric industry. With the implementation of this project, the air jet loom will be introduced in place of the Ishikawa rapier loom.

Advancing into the dyeing and finishing industries and the like in 2003, Mahin continued with management decisions toward comprehensive textile operators.

Mahin delivered products to well-known apparel manufacturers in the United States and Europe, including H&M, Marks & Spencer, the GAP, and the like, and earned high praise from overseas customers with respect to the high quality of the goods. As shown in Figure 4-5, sales have increased 1.7 times in the past five years, profit after tax has grown about 2.9 times, and with continued very stable management, Mahin executed an IPO in 2014 and the company is ambitious to further investment in business expansion.

Unit: Mil Taka



Regarding business assessment,

- (1) Simple recovery of the initial investment is in 8.06 years through revenues from reduced power consumption
- (2) With respect to IRR, in Case (i) (ten-year): 4.13%, in Case (ii) (twenty-year): 9.95%

Although the results are not necessarily appealing on business investment decisions, what is worth noting here is that the energy-saving effect of "reduction of power consumption" is the only part of revenue in this business profitability analysis, and it does not consider the business profit that can be gained by improving the productivity of local operators.

In other words, the business profitability of only the energy-saving effect is as shown in (1) and (2) above, the improvement in productivity with the air jet loom is estimated to be 1.775 times that with the rapier loom, which can be regarded as a very significant advantage in total business profitability for a business person.

The realistic business revenue growth due to enhanced productivity through BOCM model project is broadly appealing to related companies, depending only on the efforts toward promoting this growth.

Mahin went public in 2014 and is funded with some 1.5 billion yen from the market. The company is using part of that to enhance productivity and expand business, allocating the initial investment to implement this project.

Loans from financial institutions are planned to cover about 20 to 30% of the initial investment cost.

Consultations on borrowing for this project are planned with BRAC BANK, ISLAMI BANK, and the like, and in light of the financial situation for Mahin described above, there should not be any major difficulties in these loan talks with the banks.

In Bangladesh, on the other hand, annual market interest rates are very high at about 14-16%, and reduction of the interest rate burden is the greatest concern for management. Through this survey, as discussions proceed on using BOCM model project, Mahin's investment decisions will become sound, calling for early implementation of the project.

Political unrest occurs during the elections that are held once every five years in Bangladesh—as is the case now—so business owners have to conduct management in anticipation of such circumstances. Boasting over 20 years of experience, Mahin crisis management is regarded to be the highest level in the nation.

In addition, with concerns over the crises in the European economy, Mahin is shifting to risk diversification management by diversifying its business partners. Building relationships among U.S. and Japanese clothing manufacturers in recent years is a part of that, and a system of risk aversion has been arranged through the company's corporate strength and corporate attitude, and its confidence in product quality.

The Mahin project of switching in high-efficiency Toyota Industries Corporation air jet loom equipment is intended to conform to government policy searching for energy conversion, and it is also an indication of the management policy of actively avoiding future business risk. Innovation in the textile industry through the energy-saving and enhanced productivity of air jet loom equipment is noted by many government officials, and it is regarded as the framework for the broad based BOCM project.

2) Permits and License for the project development and implementation

Garment factory construction requires a variety of licenses including building permits, environmental sanitation assessments, and the like, but licensing for project implementation is not required for this project because loom equipment will be renewed in an existing factory that is already operational. And having already imported project equipment to Bangladesh confirms that there is no need of special licensing for industrial equipment.

3) Advantage of Japanese technology

A summary of the comparative results is shown in the table, with the project loom equipment (Toyota Industries Corporation air jet loom equipment) increasing productivity 1.775 times compared to the reference loom equipment (Picanol rapier loom equipment), and 15% superiority in terms of the energy-saving effect. Estimating power consumption per 1,000 square meters of fabric, this amounts to about 52% energy-saving effect for the project loom equipment 212kWh over the reference loom equipment 443kWh.

Assuming that annual textile production volume with the air jet loom equipment is produced by the reference loom equipment, estimated power consumption would be 4.625.7MWh, with an energy-saving effect of 2.412.1 MWh. The greenhouse gas reduction effect comes to $2.412.1 \times 0.67 \text{ tCO}_2/\text{MWh} = 1,616 \text{ tCO}_2$.

The amount of greenhouse gases that would be reduced if only the most conservative products were manufactured is 1,478 tCO₂.

Table: Comparative Results

Item	Rapier loom	Air jet loom
Loom manufacturer	Picanol (Belgium)	Toyota Industries Corporation (Japan)
Loom model	OptiMax	JAT810
Textile production volume (m)/year	3,675,700	6,522,600
Textile production volume (m ²)/year	5,881,120	10,436,160
Production volume ratio	1	1.775 times
Power consumption (kWh)/year	2,606,540	2,213,674
Power consumption ratio	1	0.849 times



Reference loom: rapier loom OptiMax (left) Project loom: air jet loom JAT810 (right)

4) MRV structure

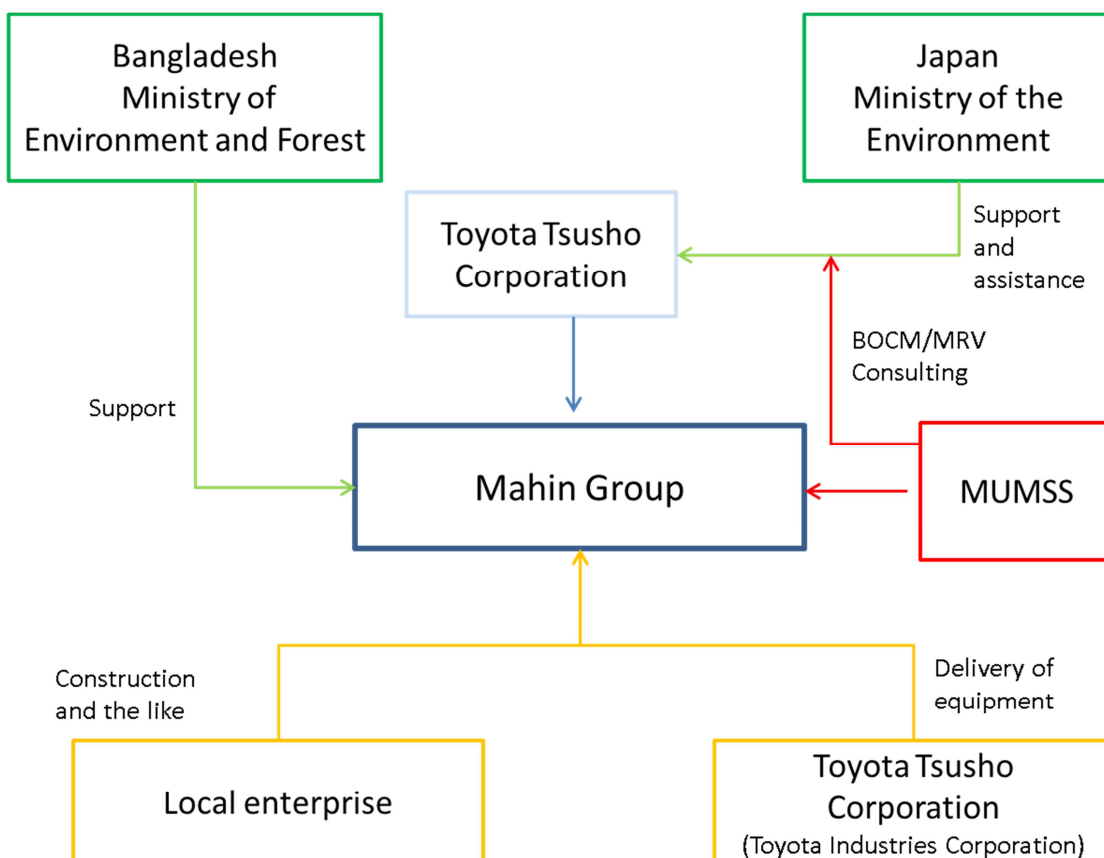
In this study, we have created a draft methodology in accordance with the BOCM guidelines of Bangladesh and Japan. In this methodology, The CO₂ emission basic unit in case of the reference loom equipment is determined by textiles and multiplied by the amount of production after the project to calculate reference emissions.

We could not obtain sufficient information about the manufactured fabrics from employers in this survey, and although we analyzed four representative types of fabric assuming the production, we need to identify data that may be available and improve the accuracy of the methodology going forward.

In addition, we need to further analyze the specifications of the reference loom and other air jet looms in terms of the superiority regarding the efficiency of the project equipment in eligibility conditions, and make careful determinations.

Regarding monitoring items other than production volume, they are automatically recorded by the data collection function of the JAT810.

Local operators do not have expertise regarding BOCM, and capacity building from the concept of methodology is needed. The Toyotsu local subsidiary will cooperate fully to ensure the smooth and successful implementation of MRV. The MRV structure is summarized in the figure. Mahin plans to establish an in-house team to implement MRV and conduct training to gain cooperation from MUMSS in order to get an understanding of the abovementioned management.



MRV structure

5) Environmental integrity and Sustainable development in host country

There has been a rapid transition in loom technology in recent years, going from shuttle type to shuttleless looms. Shuttleless technology enhanced productivity and efficiency compared to conventional shuttle technology, and while it has followed a path of progress and innovation, this technology does present a variety of challenges in the idea of ensuring environmental integrity.

Shuttleless looms include the clipper, rapier, water jet, and air jet looms. The clipper and rapier looms are highly versatile, but they are noisy and limited in terms of high-speed operation. The noise problem is directly connected to the daily working environment of worker, so it is a very important issue and a top priority to improve.

The water jet loom, on the other hand, enables high-speed operation and boasts superior functional aspects. Since it uses water to weave, however, problems arise in the disposal of the water discharged from the machines. Although wastewater treatment is an obligation imposed on operators as a matter of course in developed countries such as Japan, correspondence is still insufficient in developing countries.

As a result, the spread of the water jet loom brings the risks that are directly connected to the environmental issues of water pollution.

The air jet loom maintains a low-noise work environment and is attracting attention as a technology that achieves high-speed and high-efficiency operations compared to conventional technologies. It is a leading edge technology that is not related to the water pollution issues of the water jet loom that is popular mainly in China. Among air jet looms, Toyota Industries Corporation technology lead the world in terms of productivity and energy efficiency, and the promotion of this product is positioned to contribute to the sustainable development and environmental integrity of Bangladesh.

6) Toward project realization (planned schedule and possible obstacles to be overcome)

This project is planned to be implemented as a BOCM model project in 2015. The subject company Mahin is showing great interest in further study of improved productivity and additional technologies--including added information, overall planning, energy-saving effect, business analysis, recovery of waste heat, and the like--related to BOCM model project incentives shared through this survey, and they are ambitious to implement the project early.

Up to now, the business update on the air jet loom planned several years ahead has been a top priority of management, and there have been instructions to proceed with implementing ancillary facilities plans and the like as well. Further, devotion to learning about the BOCM framework and establishment of internal systems are underway.

We are eager to implement the project early in order to maintain the advantages of the neighboring countries amid the trouble in importing equipment and textiles as a result of the political unrest, but travel among Japanese business people is limited, and negotiations are not progressing smoothly. Some have concerns that Bangladesh might temporarily come under a military regime, which in turn casts a shadow on the smooth implementation of the project.

Toyota Industries Corporation cannot conduct normal business development due to the political situation in Bangladesh either. In close cooperation with the Toyota Tsusho Corporation subsidiary, however, they aim to

conduct business from August of this year with an eye toward starting business within the year, and engage in problem solving toward auxiliary commercialization for the next fiscal year.