DESIGN & DEVELOPMENT OF

ADVANCED TECHNOLOGIES FOR HI-TECH SHUTTLELESS LOOM (LR 450)

Minutes of 3rd PROJECT REVIEW & MONITORING COMMITTEE (PRMC) meeting

Held on 18-Aug-2018 from 10:00 Hrs to 13:00 Hrs at CMTI

Members present

Project Review & Monitoring Committee (PRMC)

Prof. S M Ishtiaque	Chairman
Dr. M K Talukdar	Member
Dr. D Yuvaraj	Member
Shri. T Parabrahman	Member
Shri. Sanjay Chavre	Member Secretary **(thru' VC)**

Textile Machinery Manufacturers' Consortium (TMMC)

Shri. Vallabh S Thumar	M/s AlidhraWeavetech
Shri. Ketan Sanghvi	M/s Laxmi Looms
Shri. Ashish Amin	M/s Premier Looms

Textile Machinery Manufacturers' Association (TMMA)

Shri S Chakraborty	Advisor, TMMA
Shri. Sachin Arora	Secretary, TMMA

Regional Textile Commissioner's Office (RTCO)

Shri. Satish Kumar	Assistant Director

Central Manufacturing Technology Institute (CMTI)

Dr. Nagahanumaiah	Director
Shri. S Satish Kumar	Joint Director
Shri. B R Mohanraj	Joint Director (P.I)
Shri. K K Rajagopal	HOD - CPC
Shri. S V Mansur	HOD - DDC (P.C)
Shri. V G Yoganath	HOD - PMD
Shri P Rajashekar	HOD - PAT
Shri. V Shanmugaraj	HOD - SVT
Shri. R S Honnatti	HOD - Purchase
Smt. Asha Upadhyaya	Sc-E
Shri. J. G. Arun Kumar	Sc-E
Shri. S. Narashimmalu	Sc-E
Shri P K Agarwala	FA & CAO
Shri. S. K. Ananth	Technical Consultant
Shri. R. Baglodi	Technical Expert
Shri. Shivaramakrishna	Weaving Expert
Project Execution Team Members	

Special Invitees

Shri. P K Mukherjee	Textile Consultant
Shri. Jay Sanghvi	M/s Laxmi Looms

Leave of Absence

PRMC Members

Shri. S. Balaraju	Member - Convener
Shri. Neeraj Kela	Member
Dr. Prakash Vasudevan	Member
Shri. Vivek Plawat	Member
Dr. K. Selvaraju	Member

TMMC Members

Shri. Dilip J Dhamanwala	M/s Life Bond
Shri Satish Raj	M/s Vaari Textiles (Absent for meeting but attended the Pre-Meeting Demo on 17thAug)

Demonstration of weaving trials @ 450 ppm on CMTI's Prototype loom

1st Pre-Meeting Demo on 17th Aug 2018 for TMMC Members

(A) TMMC members Shri Ashish Amin, Shri Ketan Sanghvi, Shri Satish Raj and Shri Vallabh Thumar witnessed the on-going weaving trials with grey fabric @ 450 ppm on the indigenously developed Prototype loom (LR-450) and interacted with the project team of CMTI.

(B) Further TMMC members thoroughly evaluated the loom for weave quality (starting marks & other weave inconsistencies), loom performance (Running consistency, noise, vibration,

temperature by feel, frequency of breakage stops - warp stops, weft stops and manual stops) and the loom response under each stoppage scenario.

(C) TMMC members also inspected the fabric samples produced on prototype loom and tested at SITRA and expressed satisfaction on the weave quality of the fabric being woven.

(D) CMTI project team also held a meeting with TMMC to discuss on the project.

(E) TMMC members also had discussions with Director, CMTI along with PI.

2nd Pre-Meeting Demo on 18th Aug 2018 for PRMC, TMMA & TMMC Members

PRMC Chairman and members of PRMC, TMMC and TMMA witnessed the demonstration of high speed weaving trials at 450 ppm on 18th Aug 2018 prior to the meeting session. PRMC Chairman and members of PRMC, TMMC and TMMA expressed satisfaction after conducting mechanical / electrical sub-system physical inspection of the machine. The loom was also checked for starting marks by frequent manual start stops. All the members expressed their satisfaction on the overall performance of the loom.

PRMC Meeting Session on 18th Aug 2018

Welcome & Opening Remarks

Dr. Nagahanumaiah, Director, CMTI, welcomed PRMC chairman & members, delegates from TMMC, TMMA and RTCO to the 3rd PRMC meeting. He noted that the indigenously developed prototype loom has successfully undergone extensive weaving trials at 450 ppm and requested TMMC members to utilize the expertise built in-house with respect to loom development. He also stressed on the need to take the project forward by continuing with Phase-II development without any break and reap the benefits of indigenization efforts made by CMTI.

Prof. S. M. Ishtiaque, Chairman, PRMC appreciated the efforts put in by CMTI and mentioned that the quality of weaving has improved drastically from the previous PRMC meeting. He indicated that it is a huge challenge to develop a high speed rapier loom and congratulated CMTI for the successful development. Chairman opined that the project should be considered as a Research and Technology Development (RTD) project and not just as an R&D project. Chairman also mentioned that DHI has initiated setting up of Centre of Excellence on textile machinery Design & Development at CMTI and IIT-D where-in the strengths of both the organizations can be harnessed efficiently.

Project Presentation by CMTI

1. CMTI presented the actions taken report based on the suggestions made by PRMC during the 2nd PRMC meeting held on 10th Jan 2018 held at CMTI.
2. CMTI then informed PRMC that the cumulative effect of the guidance of PRMC and the efforts by CMTI during the previous six months resulted in achieving/realizing the Phase-I project objective of an indigenously developed High Speed Shuttle-less Rapier Loom (450 PPM). With this, Phase-I of the project objectives / goal has been realized. ***It is to be noted here that the***

National CG Policy 2016 had identified the cam beat-up, metallurgy of loom parts, micro-processor based control system and software algorithm as the most significant technologies which domestic manufacturers are currently lacking. Addressing the above, most importantly, the following technology gaps in shuttleless looms have been bridged.

i. High speed weft insertion mechanisms
ii. Conjugate cam beat-up motion
iii. High performance integrated drive for primary motion and pick-finding motion
iv. PLC (Microprocessor) based loom control system
v. Servo-motor driven and electronically synchronized let-off & take-up motion
vi. Establishment of metallurgy and manufacturing processes for components/parts

3. CMTI then presented the summary of activities that were carried out since 2nd PRMC, aimed at improving & establishing the loom performance:

Yarn related - Sourcing of proven quality yarn:

i. Weft yarn and warp beam (Grey Cotton Ne 2/80's) proven for operation at 450 ppm procured from NTC Hassan-Karnataka and has undergone extensive weaving trials.

Loom related - Performance improvement:

i. Tension control in warp yarn improved to ±2% of set value
ii. Fine tuning of mechanical settings such as shed angle, backrest and warp stop positions, accumulator & weft presenter positioning under the expert guidance of Shri Shiva Ramakrishna, Retd. Deputy Manager (Weaving), NTC, Hassan-Karnataka.
iii. Fine tuning of let-off and take-up synchronization and control algorithm to eliminate starting marks

Weaving environment humidity regulation – critical for high speed weaving

i. Erection of enclosure around loom and installation of humidifier inside the enclosure to maintain desired humidity levels of better than 80% - a very critical factor for successful high speed weaving, implemented as per the suggestions of PRMC.

Loom performance - Benchmarking:

i. Benchmarking exercise was carried out in two phases by CMTI team at NTC, Hassan related to power consumption, Noise & Vibration and temperature profiles on reference looms operating at 450 ppm, including study of control system and HMI related aspects.
ii. The energy consumption, noise, vibration and thermal mapping on the prototype loom were evaluated and the results were comparable to or better than the Reference Loom benchmarked at NTC. The comparative results were presented to PRMC.
iii. Cumulatively, more than 1500m of fabric have been woven on the prototype loom till date without wear & tear, an indication of the durability of all the mechanical drive elements.

Fabric quality – Assessment:

i. Two samples of fabric woven on the prototype loom were inspected at SITRA, Coimbatore as per the standard 4 point inspection system and the results were presented to PRMC. CMTI stated that sample 2 fabric which was woven after identifying and correcting the faults noticed in sample 1 fabric had no weaving related defects

4. Other issues presented by CMTI:

Technology transfer & commercialization:

i. Exhaustive Technology transfer documentation pertaining to design, manufacturing, BOI and control system have been shared with TMMC to enable commercialization.

ii. TMMC is taking necessary steps at commercialization of the loom and in this regard, delegation from M/s Alidhra Weavetech has visited CMTI. A delegation from M/s Premier Looms & M/s Vaari Textiles are planning to visit CMTI shortly regarding loom development.

Patenting:

i. Filing of patent on the two novel weft insertion mechanisms developed by CMTI is under progress.

Schedule & Financials:

i. CMTI reported that Phase-I deliverable is completed. Phase-I has taken 42 months instead of proposed 24 months mainly because of the complexity of technology challenges, poor technical support from many OEM's and the difficulties in sourcing standard parts.

ii. CMTI presented the summary of accounts for the project funds and mentioned that the project cost has over-run by ₹ 94 Lakhs (Approx). The excess amount has been temporarily met from CMTI internal accruals for maintaining continuity of the project. CMTI requested that the cost over-run may be reimbursed by the project funding authorities to CMTI.

iii. CMTI requested industry go-ahead for PHASE II loom development since Industry running / trial of prototype loom is a deliverable under Phase-II.

Observations / comments by TMMC & TMMA members:

TMMC members expressed their satisfaction on Phase-I deliverables and also mentioned that the project is a distinct achievement in spite of the time over-run. The following were the observations / comments by TMMC & TMMA members wrt:

Technology transfer:

a) CMTI to share test reports and prepare loom operation & instruction manual.

b) CMTI to share manufacturing data related to man hours and machine hours of components of prototype loom.

Commercialization of Phase-I:

a) TMMC informed PRMC that the commercialization activities of phase-I will be initiated and targeted for completion in one year period.

b) TMMC highlighted that commercialization of Phase-I would be cost effective only with micro-controller. CMTI informed that the micro-controller for loom is currently under development as an internally funded project and is expected to be completed by October 2018. TMMC expressed their willingness to acquire the technology.

Industry Funding for Phase-II:

a) Considering the business and technical challenges involved in commercialization of phase-I, TMMC felt that their immediate priority is to focus their resources on Phase-I commercialization and hence it is not feasible to provide funding for phase-II development. They opined that they would take up Phase-II development after successful commercialization of Phase-I.

Extension of scope of Phase-I

a) TMMA queried regarding the feasibility of extending the scope of Phase-I, under mutually agreeable T&C, to include (i) exhaustive in-house and industrial/field weaving trials and (ii) micro-controller development for loom.

Observations / comments by PRMC members:

- PRMC congratulated CMTI for the successful execution of Phase-I of the project. PRMC stated that the machine aesthetics is comparable to international looms. It was also affirmed that the basic deliverables of Phase-I (as per Annexure-I) have been met in terms of product development & technology transfer.
- Based on inputs received from members during the meeting with respect to exploring the operational and functional limits of the loom, PRMC suggested extended testing of the prototype loom at CMTI.
- PRMC also opined that the loom should also be subjected to exhaustive industrial trials for a period of 3 months preferably at NTC.
- Ease of operation, aesthetics, ergonomics and safety aspects from customer point of view to be studied by TMMC during commercialization.
- In place of Siemens and B&R motors and drives, other sources may be explored to reduce cost of commercialization.

Observations / comments by DHI rep (through VC):

a) DHI rep was agreeable that Phase II may be initiated only after phase I machine is commercially viable considering the constraints expressed by TMMC

b) With regard to extension in scope of Phase-I as proposed by TMMA, DHI rep suggested that the details may be worked out and forwarded to DHI for consideration after getting concurrence from TMMC.

c) Chairman's concluding remarks:

a) Mechanically the loom has taken good shape and has met the Phase-I technology targets.
b) Industry partners have to strategize for cost reduction to bring out a successful commercial high speed loom.
c) Extended in-house weaving trials to be conducted at CMTI to explore the performance limits of the prototype loom.
d) Exhaustive weaving field trials can only be done at a textile mill environment. For exhaustive weaving trials, design of experiments and critical selection of good textile mill is very important.
e) Strongly recommended TMMC to invest into extended in-house & industrial trials and other cost reducing developments to add value to the development efforts.

The meeting concluded with Shri. S Satish Kumar, Joint Director, CMTI thanking the PRMC chairman, PRMC members, delegates from TMMA, TMMC, RTCO for a lively and productive participation in the meeting.

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Annexure-I

Approved milestones & Physical/Technology and Financials Targets chart
(Extract from DHI approval letter)

4.2 **Major mile stones** in terms of resource allocations are listed as the following:

Sl. No.	Expenditure Head	Estimated cost in Lakh (Rs.)				
		1st yr 2014-15	2nd yr 2015-16	3rd yr 2016-17	4th yr 2017-18	TOTAL
1	Survey, Exposure & training	8	7	5	0	20
2	Internal Facility	40	70	162	90	362
3	Facility Augmentation	15	10	10	0	35
4	Manpower	85	88	195	105	473
5	Development related Hardware & consumables	158	130	525	55	868
6	Operational Costs	20	20	60	35	135
7	Workshops, Seminars	0	0	8	2	10
8	Consultancy	12	12	9	2	35
9	Visits & Travel	7	8	16	6	37
10	Miscellaneous & Contingency	5	5	10	5	25
	TOTAL	350	350	1000	300	2000

5. **Outputs**

In case of Scheme components Centres of Excellence for Technology Development / Technology Acquisition Fund Programme, technologies are the output.

Physical/ Technology & Financial Targets & Implementation schedule:

Phase	Year	Physical / Technology Targets	Financial Targets
I	Year 1	Study of Rapier Loom Technology • Literature survey • Study of Product & process technology on state of the art reference loom • Design & Development of the first prototype of indigenous Rapier loom (≤ 450rpm)	Rs 350 lakhs
	Year 2	• Design & Development of the first prototype of indigenous Rapier loom (450 rpm) • Testing & trials of the prototype Rapier loom at CMTI • Technology transfer for First	Rs 350 lakhs

		Prototype (hard copy and soft copies of designs and drawings -3D scanned designs capable of converting into components in CNC machines)	
II	Year 3	• Trial runs at stakeholder industry. • Design upgradation to increase speeds ≤ 550rpm • Development of second prototype	Y 3: Rs 1000 lakh
	Year 4	• Technology transfer to stakeholders / textile machinery manufacturers for manufacture of Rapier loom. • Handholding - Train the user Industry and facilitate for production	Y: 4 Rs 300 lakh: Milestone: Successful trial of second prototype at CMTI.

Note: Phase II release will be after industry approval of Phase I

6. **Mode of Financing**

6.1 The project cost will be jointly funded by DHI and the Participating Industry- TMMA (Textile Machinery Manufacturers' Association (I))/ TMMC (TMM Hi-Tech Research & Development Foundation) in the ratio 80:20 without violating any condition of the Scheme/ GoI Rules.

6.2 Funding by the Department of Heavy Industry will be governed by the relevant provisions of General Financial Rules (GFR), provisions in the CG Scheme notification (as amended from time to time) and will be subject to terms and conditions indicated in paragraph 4 and 5 of the Approval letter.

6.3 Funds will always be released by DHI in the designated Project Account on prorate basis after receiving confirmation of contributions by other funding partners. Release of fund will be subject to fulfilment of terms and conditions of the Approval letter, and relevant Government order/ General Financial Rules, particularly Rules 206- 212 and 215(3) of GFR.

6.4 Release of 1st instalment of funds shall be arranged by DHI after signing the MoU by the Grantee Institute/ Organization and after due confirmation of the commitments as per the Project schedule. Pre-receipted bills will always be submitted.