

June 12, 2018

Mr. Punit Lalbhai
Executive Director
Arvind, Ltd.
Naroda Road
Ahmedabad 380025
Gujarat, India

Dear Mr. Lalbhai:

We welcome Arvind Limited as a Sponsor ("Sponsor") in the Harvey Mudd College – Ahmedabad University Global Clinic Program ("Program") for the 2018 - 2019 academic year. This letter ("Agreement") is intended to set forth our understandings concerning the Program and the Project (as defined below), which we have recently discussed. The Program is to be conducted by Harvey Mudd College – Ahmedabad University primarily for the education of its students but also to benefit you.

The objectives, research and deliverables of the Program, as they pertain to you, are described in Exhibit A ("Project"). All creative works, inventions, and discoveries made as a result of the Project during the time period beginning on the date that the Sponsor signs this letter and ending on the date that Harvey Mudd College – Ahmedabad University delivers the final report will collectively be understood as the "Work Product."

The Project will be conducted for academic credit by six or more students of senior or junior standing from HMC and Ahmedabad University, and advised by faculty member(s) appointed by Harvey Mudd College – Ahmedabad University.

Harvey Mudd College – Ahmedabad University is engaging in this activity for educational purposes. Harvey Mudd College – Ahmedabad University is not providing paid labor of the sort ordinarily performed in commercial operations. In this regard, Harvey Mudd College – Ahmedabad University does not represent, warrant or guarantee the suitability of any Work Product for the Sponsor's intended use or for any other use. Neither party shall be liable to the other with respect to any subject matter of this Agreement under any contract, negligence, strict liability of other legal or equitable theory for any indirect, exemplary, special, incidental or consequential damages or lost profits. The Sponsor agrees to properly inspect all Work Products of the Project prior to use and agrees that any such use is solely at the Sponsor's own risk.

The Sponsor agrees to support Harvey Mudd College – Ahmedabad University's educational programs by paying Ahmedabad University the sum of Rs. 20,00,000 as specified in Exhibit B.

Intellectual Property

Harvey Mudd College – Ahmedabad University agrees that the Work Product will belong entirely to the Sponsor. Harvey Mudd College – Ahmedabad University will reasonably cooperate in protecting the Sponsor's interests in

and to any Work Product and will reasonably provide the Sponsor with information necessary to perfect any claim the Sponsor may have with respect to the ownership of the Work Product, including providing the Sponsor with an assignment of all Harvey Mudd College – Ahmedabad University's rights in and to any such Work Product.

Warranty

The Sponsor affirms that any and all information and materials it shares with Harvey Mudd College – Ahmedabad University in relation to the Program and the Project have been lawfully collected or otherwise obtained. The Sponsor also warrants and represents that sharing of such information and materials with Harvey Mudd College – Ahmedabad University and the use of the same by Harvey Mudd College – Ahmedabad University and the students as contemplated by this Agreement will not violate or infringe the rights of any third party nor violate any applicable laws, rules, or regulations. The Sponsor agrees to expressly notify Harvey Mudd College – Ahmedabad University in writing if any of the information or materials it shares with Harvey Mudd College – Ahmedabad University are subject to the export control laws, including the Export Administration Regulations or the International Traffic in Arms Regulations. A copy of Harvey Mudd College – Ahmedabad University's "Policy on Confidentialities" is enclosed.

The Sponsor and Harvey Mudd College – Ahmedabad University will only reference each other publicly with respect to disclosing the existence of this Agreement, the identity of the parties, and the nature and scope of the Project. The Sponsor will not use the name of Harvey Mudd College – Ahmedabad University, nor of any member of the Project staff, in any publicity expressing or implying any approval of the Sponsor by Harvey Mudd College – Ahmedabad University.

Indemnification

Harvey Mudd College – Ahmedabad University shall indemnify and hold the Sponsor harmless from liability resulting from the negligent acts or omissions of College, its agents, students or employees pertaining to the activities to be carried out by Harvey Mudd College – Ahmedabad University pursuant to the obligations of this Agreement.

The Sponsor shall indemnify and hold Harvey Mudd College – Ahmedabad University, its trustees, officers, employees, students, successors, and assigns harmless from any liability or loss resulting from judgments or claims against the Sponsor arising out of the activities to be carried out by the Sponsor pursuant to the obligations of this Agreement, including but not limited to the use by Sponsor of the results of the Work Product.

Harvey Mudd College – Ahmedabad University's liability under this Agreement shall be limited to the amount of the fee paid by Sponsor. Similarly the liability of Sponsor under this agreement for breach of any terms and conditions of this agreement shall not exceed Rs. 20,00,000/-.

The parties are not affiliated and neither has any right or authority to bind the other in any way.

Closing

This Agreement may be executed in one or more counterparts, each of which together will constitute one and the same Agreement. For purposes of executing this Agreement, a facsimile copy (including an image delivered via email) of this Agreement, including the signature pages, will be deemed an original. This is the entire Agreement among the parties with respect to the subject matter hereof, and supersedes all proposals, oral or written, all negotiations, conversations, or discussions between or among the parties relating to the subject matter of this Agreement. No changes, waivers, amendments or alterations will be effective unless in writing and signed by the parties.

Exhibit - C being Policy and Confidentialities shall forms an integral part of this agreement.

If the foregoing meets with the Sponsor's approval, we would appreciate your signing both of the enclosed originals of this Letter of Understanding / Agreement and returning one to the undersigned.

Sincerely,



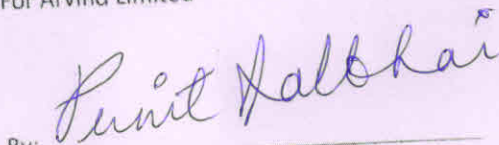
Susan E. Martonosi, Ph.D.
Director, Global Clinic
Harvey Mudd College



Sanjay Chaudhary, Ph.D.
Associate Dean, School of Engineering and Applied Science
Ahmedabad University

Accepted this 25 day of JUNE, 2018

For Arvind Limited



By: _____
(Signature)

MR. PUNIT LALBHAI, EXECUTIVE DIRECTOR
(Print Name) ARVIND LTD

Exhibit A: Project Description

Arvind Limited Global Clinic Project "Reducing Energy Consumption in Wet Dry Cycles"

1. BACKGROUND

Current manufacturing practices for fabrics involve multiple wet and dry cycles in the processing stage, post mercerization and post bleaching, and consume significant amounts of energy. Presently, wet fabric is dried by passing it over a series of rotating hollow cylinders of 800 mm diameter, approximately 2000 mm wide and made of 3-4 mm thick steel. The drum inside is heated with saturated steam at 2 – 3 bar(g) pressure. The energy transferred to the drum (which is partly used for drying the fabric) causes condensation of the steam inside the drum; this condensate is taken out of the drum. Figure 1 shows a typical machine for mercerizing.

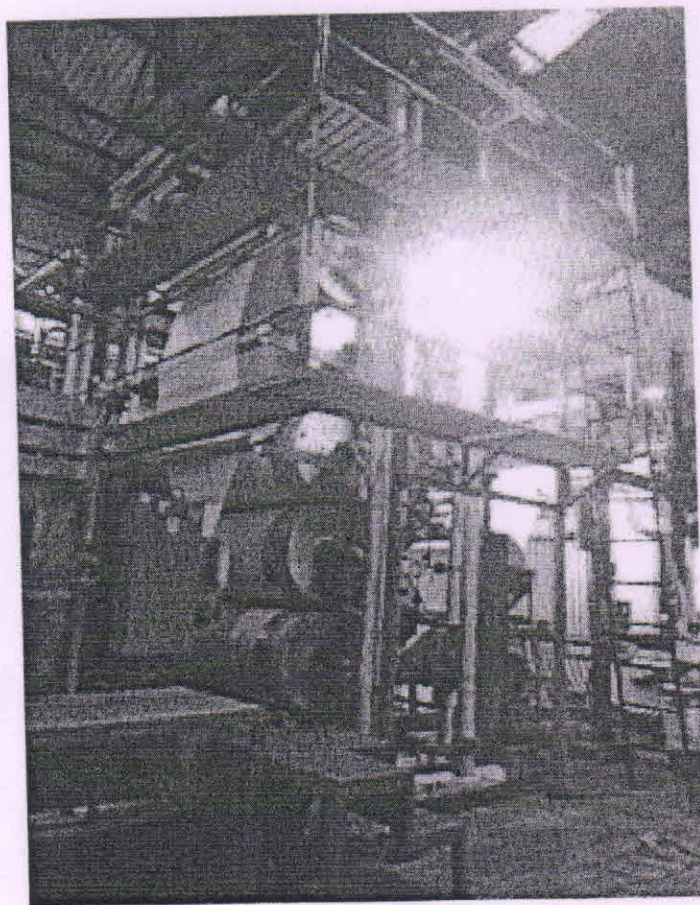


Figure 1. Typical mercerizing machine showing the drying drums.

The preceding process is fabric washing (generally referred to as the wet cycle) followed by squeezing between rollers such that the moisture content in the fabric is about 40 – 50 %. This fabric is input to the drying process at the exit of which 7 % moisture content is desired; this is the dry cycle. During the entire process of manufacture, the fabric undergoes many such wet and dry cycles.

At the drum pressure, steam temperature is $130 - 140^{\circ}\text{C}$ and drum surface temperature is about 110°C . The fabric passes over several drums with each drum causing some of the moisture to evaporate. This operation is performed over several drums in series until the desired moisture content is attained. The last few drums, towards the end of the drying process, are for the finishing operation and the steam flow to the drum is regulated to maintain control on the fabric temperature. A schematic is shown in Figure 2.

The fabric is cotton.

The efficiency of the drying process, defined as the ratio of energy needed to reduce the moisture content of the fabric to the energy delivered of steam actually consumed in the process, ranges from 45 – 50 %, i.e. almost half the energy of the steam is not used for heating the fabric.

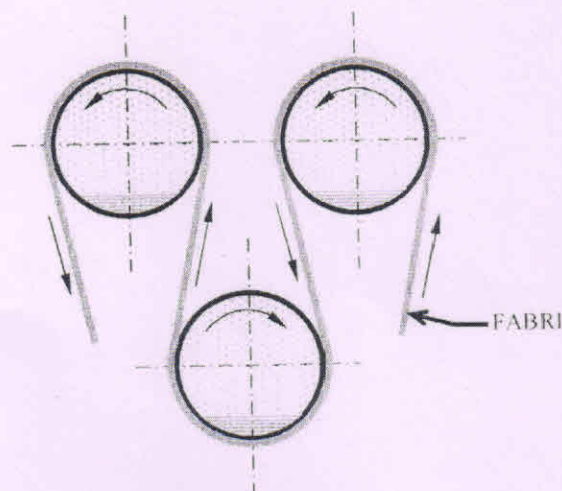


Figure 2. Schematic of the drying process for mercerization.

The second method of drying is employed for finishing and is shown in Figure 3. Here, hot air is generated by burning natural gas which is diluted with ambient air and then blown on to the lower surface of the moving fabric. The air picks up moisture as it flows through the fabric. This up flowing air from the upper side of the fabric is collected and exhausted to the ambient air outside the factory building. This process is not the subject of study for this project.

While redesigning the processing cycle to accomplish multiple steps in one stage is possible, it is generally found to be economically unviable at scale. Similarly, there are challenges in directly using wet fabric for further processing, and there seems limited upside to further optimizing existing drying techniques.

As a result, Arvind is looking at new ways of drying fabric to achieve a step change in the efficiency of the above process.

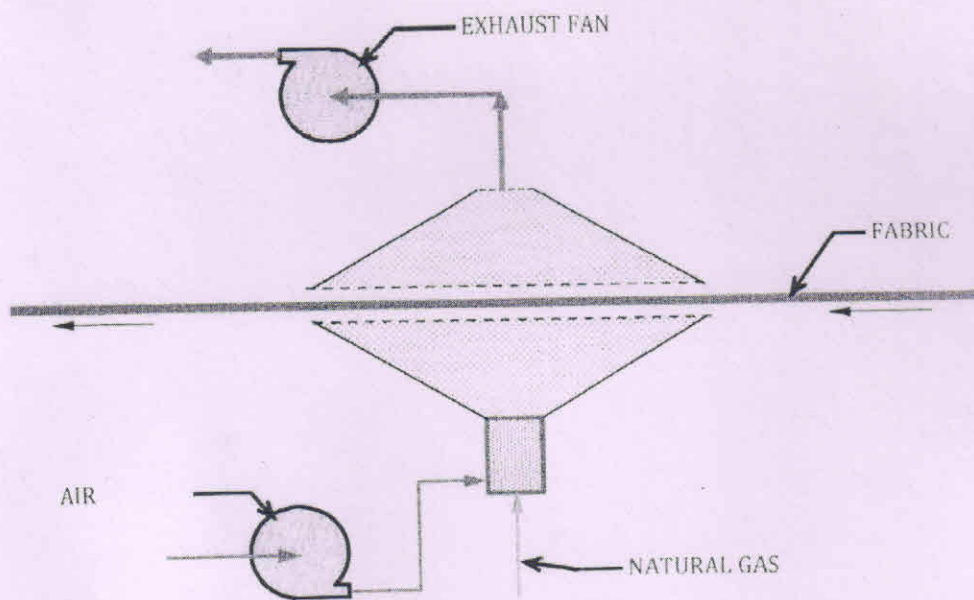


Figure 3. Schematic of the drying process for finishing.

2. OBJECTIVE

The objective is to increase the efficiency of the drying process by at least 10% by either modifying the existing process and/or by developing new concept designs.

3. SUGGESTED METHODOLOGY (TENTATIVE)

The tasks could be: (a) study of existing process, (b) examine scope for increasing efficiency of the existing process, (c) study of drying of a fabric, and (d) develop new concept designs and their expected efficiencies.

In (a), the energy balance on an individual drum, and then on the entire drying portion, would have to be evaluated. From these and other data, an energy balance would have to be worked out using which the scope for interventions and their effectiveness will have to be estimated, task (b).

In parallel, alternate methods for drying can be explored, task (c), independent of the existing process. Several concept ideas can be generated which can be reduced to a few using techniques of design evaluation. One such design can be worked out in detail for achievable efficiency improvement, task (d).

Finally, all the analysis can be combined to generate the recommendations.

4. DELIVERABLE

1ST semester

Propose and evaluate multiple alternate options for transferring energy to fabric

- (i) Audit of the existing process and scope for efficiency enhancement.
- (ii) Basic feasibility studies through controlled, small-scale and time-efficient experiments/system modelling exercises.

- (iii) Finalize, at the most two, most promising options to explore in detail. Depending on the complexity of the proposed options, also decide on the most feasible output form factor e.g. working prototype / solution design / others.

2nd semester

In-depth exploration of the finalized options

- (iv) Solution definition.
- (v) Technical and economic feasibility studies.
- (vi) Clear path to how could the options be scaled within existing setups.

5. OUTCOME

At least one new design and scope for improvement in existing process for improved efficiency of the drying process will be the outcome of this study. Also, a detailed report of all the work done.

Exhibit B

Arvind Limited

Harvey Mudd College-Ahmedabad University Global Clinic for 2018-2019

Payments to Ahmedabad University

Project Sponsor will provide Rs. 20,00,000 in one full payment payable by July 25, 2018

Payment Submission

Accounts Payable Contact

To assist our Business Affairs Office with invoicing, please provide the name, address, telephone, and email address of the person responsible for invoice payments.

Name: MR. SAMIR AGARWAL
Address: ARVIND LTD, NARODA ROAD, NEAR CHAMUNDA BRIDGE
City: AHMEDABAD State: GUJARAT Zip Code: 380025
Phone Number: 079-30138258 / M-9962995606
Email Address: samir.agarwal@arvind.in

Exhibit C: Policy on Confidentialities

Harvey Mudd College

Global Clinic

Policy on Confidentialities

Harvey Mudd College (HMC) Clinic projects are generally conducted in an open academic forum of students and faculty. The purposes are first, student education and second, client benefit. We believe that these are best conducted under the most realistic team-client relationships possible. Therefore, it is important for both the Sponsor and the students and faculty to come to an understanding about specific confidentialities at the outset of project work.

Strict confidentiality in the industry sense is not feasible within the college environment, where the learning process involves free and open interchange of ideas and criticism. We observe a hierarchy of company confidences ranging from proprietary formulations, product performance, research and design data, and manufacturing costs, to sales figures etc. Also, we note that such confidences may be revealed incidentally or accidentally in the relatively open project atmosphere. Potential clients should be alerted to the following educational practices in our clinic operations:

- As a center of learning, HMC must bear in mind that the educational value of the Clinic experience is paramount. But this fact need not be inconsistent with a reasonable policy of confidentiality. Indeed, the educational value of the Clinic experience is enhanced by overtones of confidentiality, because all professional practice requires judgment in dealing with customer confidences. In particular, Clinic students need to learn the distinction between Sponsor-generated data and project-generated data. The HMC Clinics can provide a safe and supportive climate for teaching students how to handle these student opportunities, including the development of professional attitudes toward the rights of the respective parties.
- Specific applications of Clinic work naturally belong to the client who paid for the work, but, with appropriate permission, Clinic-generated abstract models and data should ideally be usable to form the basis of publishable work by Clinic faculty and students.
- At the end of the academic year, the "Projects Day" open house permits each student team to present its results to a limited group of invited client representatives and guests.

- Throughout the academic year Clinic project teams give weekly presentations describing the progress of their work. All faculty and students are invited to these presentations, and attendance by Clinic sponsor representatives is an occasional occurrence. However such disclosures should not be of the extent that the said invention becomes disqualified for patent application.
- The faculty and students involved in Clinic work request the right to timely publication of novel results generated by Clinic teams while working on a Sponsor's project. Project-related work may be submitted for publication within a year after delivery of the final report, but only with the Sponsor's prior approval. Following that year, the Sponsor must be given an opportunity to review and comment on any proposed publication. The year's delay allows the Sponsor to initiate patent defense of any innovation arising in the work. The Clinic team and HMC-AU agree to assign all patent and intellectual property rights to paying Sponsor. Further, any publication of the results shall be after the Sponsor makes an application for Patent and not before that in case if the Sponsor wishes to file a Patent application. In case if Sponsor does not want to make a patent application, Sponsor shall inform Harvey Mudd College - Ahmedabad University in writing and once such a confirmation is received from Sponsor Harvey Mudd College - Ahmedabad University can proceed with the publication.
- It is Clinic policy to decline any "classified" projects of the U.S. government because of the impossibility of maintaining requisite security procedures.

For more information, please contact:

Professor Susan Martonosi
Director, Global Clinic
301 Platt Blvd
Claremont, CA 91711
909-607-0481
909-607-7129 (Fax)
martonosi@g.hmc.edu