Dear Readers

Advances in Synthetic Resin Adhesives for Panel Products

Synthetic resin adhesives play a stellar role in the development and efficient use of wood and wood based panel products. These resins were introduced as woodworking adhesives during the early 1930s, but their popularity gained momentum during World War II and is still increasing day by day. Synthetic resins are man-made polymers which resemble natural resins in physical characteristics but they can be tailored to meet any kind of woodworking requirements. These resins impart the maximum water resistance properties to glue lines and joints in comparison to the natural adhesives. The resin adhesives for plywood in India are mainly of phenolic or amino categories out of which Phenol and Urea Formaldehydes dominate wood based panel products for structural usage and other applications. In recent years, Polyurethane resin has made in-roads which is considered relatively eco-benign.

Although there exist many publications on technologies related to glue, wood adhesives, wood polymer and polymers for wood composites there is a need to bring out a comprehensive compilation which simplifies the matter for easy understanding and for commercial applications. The industrial personnel
need the basic understanding on the materials used for resin manufacturing which are not available in hitherto published works. Through the dedicated efforts of senior Scientists of IPIRTI, a comprehensive hand book “Synthetic Resin Adhesives for Panel Products in India” is published which has been released by the Hon’ble Minister, Environment, Forests & Climate Change, GoI during the last Annual General Meeting. Based on Indian climatic conditions the manufacturing processes for panel products using different synthetic resins are to be optimized - which are discussed in detail. This book focuses on indepth information about the raw material required for resin making which eventually reflects on the bond quality of the panel products. Keeping in view the harmful effects on the end users and environmental considerations, the book also deals with developing resin system using suitable scavengers that could mop up the free formaldehyde at the stage of resin preparation.

The information presented in this book are based on research activities carried out at the Indian Plywood Industries Research and Training Institute (IPIRTI) and elsewhere as well as on the author’s experience in research and production of wood based panels with selected references cited under each section. Factors that affect the adequacy of the glue bonds are highlighted with necessary remedies to resolve the issues. The optimized synthetic resin formulations for making quality panel products that conform to relevant standards and the process of manufacturing phenolic and amino resins including the polyurethane resins have been described in detail. Plant and machinery for resin manufacturing, gluing faults and remedies for plywood and final finishing by putty have also been dealt.

It is hoped that this publication of IPIRTI will be quite useful for the Panel Industries, academicans as well as students and provide the necessary technical inputs for manufacturing quality panel products.

Dr. B. N. Mohanty, IFS
Director, IPIRTI
Flush door with hollow core (tubular core) particle board infill was developed with an idea of reducing the timber consumption for core infill during the manufacture of a flush door by Shri. Prakash V. Scientist and his team at IPIRTI, Bengaluru. Hollow core (tubular core) particle boards available in India are mostly imported which are manufactured using extrusion pressing technology. In this study tubular board was produced by cope and drag method i.e. particle board was developed into two halves using an indigenously developed die using a conventional flat press, later on these two halves of the particle board were bonded together using a specially formulated resorcinol cold setting resin. This particle board was used as core infill material to develop a flush door. The door thus developed was subjected to testing as per Indian Standard, IS: 4020 “Method of testing door shutters”, Results of the tests conducted revealed that the door conforms to the requirements of IS: 2202. This study also reveals that the tubular board can be developed using flat press using cope and drag method.

For more details, contact: The Director, IPIRTI, Bengaluru
The study was carried out to widen the raw material base for existing as well as upcoming MDF units in the country. Institute has identified *Melia dubia* as one of the promising species for panel industries, accordingly series of studies have been undertaken to evaluate suitability of *Melia dubia* for various grades of plywood/ particle board and LVL. There is a shortage of information on the suitability of fibers from many plantation grown species for manufacturing of alternative panel products. This study was conducted to determine the suitability of plantation grown timber species *Melia dubia* as a raw material for Medium Density Fiber (MDF) Board, by Shri. Uday D.N., Scientist and his team at IPIRTI, Bengaluru. MDF panels of thickness 12 mm were made with urea formaldehyde resin using *Melia dubia* species. Two different fibers refined at same parameters of 6 kg/cm² of *Melia dubia* viz., one month and eight months old were studied. Physical and Mechanical properties were tested according to IS12406 (2003) Specification for Medium Density Fiberboards for General Purpose for Grade-2. The results showed that the panels made using freshly prepared fibers yielded good physical and mechanical properties were conforming to the requirements for MDF as specified in IS12406 (2003) standards. It has also been observed that the properties of boards are depended on the length and also on the age of fibers. These results indicate that MDF panels can be made from wood fibers derived from *Melia dubia*. The study was limited to lab scale. Additional work is needed to ascertain the performance of MDF panels from this species through pilot and production scale trials.

For more details, contact : The Director, IPIRTI, Bengaluru
Industry visits

04.08.2017-07.08.2017: Shri. S.C. Sahoo, Scientist, IPARTI Field Station, Kolkata visited M/s. United Ply, Gujarat to solve the floor level problem during manufacturing of plywood and also guided how to improve the bonding of the plywood.

09.08.2017: Dr. B.N. Mohanty, IFS, Director, IPARTI visited Jadua Nursery of Institute of Forest Productivity (IFP), Ranchi at Hajipur, Vaishali, Bihar Unit where Bamboo Primary Processing Machines were installed and discussed about the future prospects of the Common Facility Centre (CFC).


Meetings/Seminars/Conferences

07.07.2017: Shri. S.C. Sahoo, Scientist, IPARTI Field Station, Kolkata attended the meeting organized by M/s. Wood Cure Enterprises, Kolkata.

07.07.2017: Dr. B.N. Mohanty, IFS, Director, IPARTI attended the meeting of Research Institutes dealing with Bamboo Research and Development in the Country held under the Chairmanship of Secretary, MoEF&CC, New Delhi. Gave a presentation on High-end Bamboo Products developed at IPARTI and their prospects.

07.07.2017: Dr. Manoj K. Dubey, Joint Director as an External Expert Member attended the Selection committee meeting for SRF in CSIR Funded Project on “Value addition in Bamboo, Canes and Lantana through thermal modification” at Institute of Wood Science & Technology (IWST), Bengaluru.

12.07.2017: Working group meeting of CED: 11 with reference to formulation of Standard for internal doors was called on in the chamber of Shri. Anand Nandanwar, Scientist, IPARTI, Bengaluru. Dr. S.K. Nath, M/s. Greenply Industries Ltd., Kolkata and Shri. Nitin Vaze, M/s. Sleek Boards India LLP, Pune
joined the meeting.

17.07.2017: Dr. B.N. Mohanty, IFS, Director, IPIRTI participated in the Regional Research Conference under the Chairmanship of Shri. Siddhanta Das, DGF&SS, MoEF&CC at Institute of Wood Science & Technology (IWST), Bengaluru.

18.07.2017: Dr. B.N. Mohanty, IFS, Director and Dr. Manoj K. Dubey, Joint Director, IPIRTI attended the meeting with Bamboo Industry members about Bamboo Scenario in India and the Roadmap for future growth chaired by DG, ICFRE at Institute of Wood Science & Technology (IWST), Bengaluru.

126th Board of Governors (BoG) Meeting of IPIRTI

A view of 126th BoG meeting of IPIRTI, Bengaluru chaired by Shri. Ajay Narayan Jha, Secretary, MoEF&CC

Shri. Ajay Narayan Jha, Secretary, MoEF&CC, Govt. of India, releasing a video CD

126th Meeting of the Board of Governors (BoG) of IPIRTI held on 28th July, 2017 at IPIRTI, Bengaluru. The meeting was chaired by Shri. Ajay Narayan Jha, Secretary, Ministry of Environment, Forests & Climate Change, Govt. of India, New Delhi. Dr. B.N. Mohanty, IFS, Director & Member Secretary convened the meeting.

The Chairman appreciated the uniqueness of R&D activities carried out by IPIRTI. On this occasion, a video CD about “Bamboo: The Game-Changer for North-East India” was released by the Hon’ble Chairman in the interest of Bamboo sector of the Country.
10.08.2017: Dr. B.N. Mohanty, IFS, Director, IPIRTI participated and presented a paper on growth of plywood industry in the Workshop on “Enterprise Development in Bamboo, Other Wood Biomass Products and Medicinal Plants in Bihar” at Patna organized by Department of Environment and Forests, Government of Bihar and Action on Climate Today (ACT).

11.08.2017: Dr. B.N. Mohanty, IFS, Director, IPIRTI attended the meeting on Green Skill Development Programme (GSDP) under the Chairmanship of Shri. Siddhanta Das, DGF&SS, MoEF&CC at Indira Paryavaran Bhawan, New Delhi.

22.08.2017: Shri. Uday D.N., Scientist had meeting with the delegates of Sarawak Timber Association (STA), Malaysia and Plywood manufacturing industries of Kerala and presented paper on “Scenario of Panel products in India” at Cochin.

23-24.08.2017: IPIRTI along with TIFAC (Technology Information, Forecasting and Assessment Council) organized a Stakeholder’s Workshop for the Green Forestry sector on 23.08.2017 under the Global Technology Watch Group (GTWG) project of climate change sponsored by Department of Science and Technology (DST). Dr. B.N. Mohanty, IFS, Director, IPIRTI as a member attended the 3rd Meeting of GTWG for Green Forestry Sector presented a write-up on “Livelihood improvement through development of wood products industry”. Dr. Manoj K. Dubey, Joint Director and other senior Scientists of IPIRTI were also participated in aforesaid workshop as special invitees.

28.08.2017: Dr. Manoj K. Dubey, Joint Director was invited for lecture on Plywood, Particle and MDF in India for the training on Forest Utilization of Range Officers from CASFoS, Coimbatore at the Institute of Wood Science and Technology (IWST), Bengaluru.

28.08.2017: Dr. Manoj K. Dubey, Joint Director participated as an External Expert member of the Research Advisory Committee (RAC) meeting of a Ph.D candidate at the IWST, Bengaluru for the project proposal entitled “Effects of processing parameters on the properties of Wood Plastic Composites (WPC)”.

20.09.2017: Shri. Uday D.N., Scientist presented paper on “Role of IPIRTI in promoting Bamboo Sector in India” at Institute of Wood Science and Technology (IWST), Bengaluru during 5 days training programme for Potential industrialists and farmers.
The 54th Annual General Meeting (AGM) held on 28th September 2017 at MoEF&CC, New Delhi under the chairmanship of Dr. Harsh Vardhan, Hon’ble Minister for Environment, Forests & Climate Change, Govt. of India and President, IPIRTI Society.

During the course of Meeting, the Hon’ble Minister released the book named “Synthetic Resin Adhesives for Panel Products in India” authored by Ms. Sujatha, Dr. Mamatha and Dr. B.N. Mohanty. While releasing the book, he emphasized that concrete course of action is needed on the matters dealt in the book which are pertinent and timely in the interest of Panel Industry.
The following Research Reports of the completed projects were also released by Hon’ble Minister on this occasion:

(1) Evaluation of Multicomponent Biocide for Protection of Plywood and Other Panel Products.
(2) Manufacture of Flushdoor with Engineered Core Infill

**Visit of Dignitaries**

28.08.2017: 38 Range Forest Officer (RFO) Trainees from Tamil Nadu Forest Academy (TNFA) visited IPIRTI, Bengaluru. Dr. B.N. Mohanty, IFS, Director, IPIRTI addressed trainees and gave a lecture about prospects of Plywood & other panel products.

29.08.2017: Shri. Issac Emanuel, M/s. Covestro (India) Private Limited, Maharashtra visited IPIRTI, Bengaluru and had discussion with Dr. B.N. Mohanty, IFS, Director, IPIRTI about prospects of Polyurethane Resins.

01.09.2017: Shri. M. Pullaiah, Andhra Pradesh visited IPIRTI, Bengaluru and had meeting with Dr. B.N. Mohanty, IFS, Director, IPIRTI for discussion on MoU for Technology Transfer.

06.09.2017: Shri. Ghani Zaman, Bamboo Expert visited IPIRTI, Bengaluru and had meeting with Dr. B.N. Mohanty, IFS, Director, IPIRTI about Bamboo Sector development in India.

11.09.2017: Shri. Haresh Ajbani, Director, M/s. Vritti Impex Pvt. Ltd., visited IPIRTI, Bengaluru and had meeting with Dr. B.N. Mohanty, IFS, Director and Ms. Sujatha D., Dr. K.Ch. Varada Rajulu, Dr. Narasimha Murthy Scientists to solve the floor level problems.

13.09.2017: Shri. D.S. Bhatia, Senior Vice President, M/s. Protos Engineering Co. Pvt. Ltd., Mumbai visited IPIRTI, Bengaluru and had meeting with Dr. B.N. Mohanty, IFS, Director, IPIRTI and discussed about the possible collaboration.

**MoUs signed**

A Memorandum of Understanding (MoU) was signed and exchanged between Dr. B.N. Mohanty, IFS, Director, IPIRTI and Dr. Ajay Kumar Mohapatra, Managing Director, Odisha Forest Development Corporation Ltd. (OFDC) for setting up Bamboo industries in the State on 24.07.2017.

A Memorandum of Understanding (MoU) was signed and exchanged between Dr. B.N. Mohanty, IFS, Director, IPIRTI and Shri. Surendra Kumar, IFS
Director, Institute of Wood Science and Technology (IWST) to leverage the strength and compliment the weaknesses of either institutions for a holistic growth of wood and ancillary sectors including Panel industries on 29.08.2017.

MoUs were signed by Dr. B.N. Mohanty, IFS, Director, IPIRTI for testing and evaluation of fire retardant doors for 60 mins. and 120 mins. with the firms viz., M/s. Hans Enterprise, Mumbai; M/s. Shreeji wood craft Pvt Ltd., Mumbai; M/s. Lucky ply & laminates, Gujarat; M/s. Space wood Furnishers Pvt. Ltd., Maharashtra; M/s. Thermal Fabricators Pvt. Ltd., Maharashtra; M/s. United plywood Industries, Gujarat and M/s. Timbet door solutions, Gujarat during July-September 2017.

**World Bamboo Day Celebration**

Dr. B.N. Mohanty, IFS, Director; Dr. Manoj K. Dubey, Joint Director and other Scientists & Technical Staff took part in the World Bamboo Day Celebration through Bamboo Society of India during 17-18.09.2017 at Chitra Kala Parishad, Bengaluru. Dr. B.N. Mohanty presented a paper about High End Bamboo Products developed by IPIRTI and distributed certificates to members of Medha Community who have undergone Bamboo Training on the eve of World Bamboo Day.
Other activities

Celebration of Independence Day
71st Independence Day of the Nation was celebrated in the Institute on 15th August 2017 with full enthusiasm. Dr. B. N. Mohanty, IFS, Director hoisted the National Flag and addressed the staff members. Dr. Manoj K. Dubey delivered a speech on this occasion. Cultural programmes were organized and all the staff members actively participated by performing drama on patriotic themes, singing patriotic songs, delivering speech etc.

Swachhata Drive

Swacchhata Day was observed by organizing Campus Cleanliness Drive inside the campus & facilities. Staff and Trainees of the institute took part in the drive.

TRAINING

One Year Post-Graduate Diploma Course on Wood and Panel Products Technology:

33 trainees are presently undergoing the 28th Batch of one year Post Graduate Diploma Course in Wood and Panel Products Technology (WPPT).

Short term vocational training courses:

10.07.2017-14.07.2017: A training course on “Plywood Manufacturing Technology-I (Log Storage, Centering, Peeling, Clipping, Drying, Knife Grinding) was conducted for three candidates at IPIRTI, Bengaluru.

31.07.2017-04.08.2017: A training course on “Plywood Manufacturing Technology-II (Adhesives for Plywood and Plywood Manufacturing Resin preparation, Gluing, Hot pressing) was conducted for six candidates at IPIRTI, Bengaluru.
Special training courses:

One week refresher training course for IFS officers on “Bamboo/Wood Resource Development and Value Addition for Sustained Livelihood” was organized during 17-21.07.2017 at IPIRTI, Bengaluru. Dr. B.N. Mohanty, IFS, Director presented a technical paper in the training course. Dr. Manoj K. Dubey, Joint Director and Dr. Vipin K. Chawla, Scientist as a Course Director and Course-coordinator respectively assisted the team. As a part of training, IFS officers also visited M/s. Growmore Biotech Ltd., Hosur; M/s. INFOSYS Sarjapura Farm for model Bamboo Plantation and M/s. Hunsur Plywood Industries Ltd. regarding Agroforestry of Melia dubia and manufacture process of plywood from plantation timber. “Experience sharing” and “Valedictory session” were also arranged for IFS officers.

04.08.2017-08.08.2017: IPIRTI established training Centre for Primary Processing of Bamboo to produce Bamboo Sliver for Mat making at CFC, Bhatoli Nursery, Talwara region, Punjab. Under the supervision of Dr. Vipin K. Chawla and Dr. Pradeep K. Kushwaha, Scientists of IPIRTI, eleven staff members from Punjab Forest Department were trained for Bamboo processing and also imparted training for maintenance of machines such as Bamboo cross cutting machine, external knot removal machine, Bamboo radial splitting machine, Bamboo knot removing and planning machine, Slab making machine, Sliver making machine, Hot air oven, Bench grinding machine and Multi Bamboo cutter grinding machine.

31.08.2017-04.09.2017: IPIRTI established a training centre for Primary Processing of Bamboo to produce Bamboo Sliver for Mat making and round stick at CFC, Jadhua Nursery, Hajipur, Bihar. Under the supervision of Dr. Vipin K. Chawla and Dr. Pradeep K. Kushwaha both Scientists of IPIRTI, twelve
staff members from Institute of Forest Productivity (IFP), Ranchi were trained for bamboo processing and stick making. Both also conducted training for maintenance of the Bamboo machinery and round stick making machines.

15-16.09.2017: A Special training course on Preliminary Bamboo Processing was conducted for six persons of Tribal Association from Bellary at IPIRTI, Bengaluru.

**SHORTTERM TRAINING COURSES FOR SEP- DEC, 2017 AT BENGALURU**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Title of the Training Course</th>
<th>Duration</th>
<th>Date</th>
<th>Fees*</th>
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<tbody>
<tr>
<td>1.</td>
<td>Low Cost Phenolic Resins Using Renewable Bio Materials As Replacement For Phenol</td>
<td>5 days</td>
<td>Sep 11-15</td>
<td>17250</td>
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<tr>
<td>2.</td>
<td>Low Formaldehyde Emission Adhesives For Plywood And Particle Board</td>
<td>5 days</td>
<td>Oct 09-13</td>
<td>17250</td>
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<tr>
<td>3.</td>
<td>Defects And Remedial Measures In Plywood Manufacture</td>
<td>5 days</td>
<td>Nov 13-17</td>
<td>17250</td>
</tr>
<tr>
<td>4.</td>
<td>Testing Of Plywood And Block Board As Per IS:303,IS:710,IS:1328,IS:4990 And IS:1659</td>
<td>5 days</td>
<td>Dec 11-15</td>
<td>23000</td>
</tr>
</tbody>
</table>

** Programme Coordinator: Dr. V K Upadhyay, Head, IT & SORIT (upadhyay@ipirti.gov.in). You can apply online by filling and submitting the Registration Form (PDF)/Registration Form (doc). Registration has to be done 10 days before the date of commencement of the course by remitting prescribed course fee. Fees payable to the organization may be sent by crossed Demand Draft in favour of Director, IPIRTI, Bengaluru and sent by post to Post Bag No.2273, Tumkur Road, Yeshwanthpur PO, Bengaluru - 560 022.

* 18% GST
**Lodging and Boarding are not included and have to be arranged by the trainees.**

Programme Coordinator: Dr. Ranjana Yadav (ranjana@ipirti.gov.in) IPIRTI Centre (MoEF&CC, Govt of India) B-65, Phase -7, Industrial Area, Mohali-160055, Punjab. Tele: 0172-5095875. Registration has to be done 10 days before the date of commencement of the course by remitting prescribed course fee. Fees payable to the organization may be sent by crossed Demand Draft in favour of Director, IPIRTI, Bengaluru. You can apply online by filing and submitting the Registration Form.

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**SHORT TERM TRAINING COURSES FOR SEP - DEC, 2017 AT KOLKATA**

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<td>Retention of Preservative Chemical</td>
<td>5 days</td>
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<td>2.</td>
<td>Testing of Plywood, Block Board, Flush Door</td>
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<td>Oct 09-13</td>
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<td>3.</td>
<td>Low Cost and Special Resin For Manufacture Of Plywood</td>
<td>5 days</td>
<td>Nov 18-22</td>
<td>17250</td>
</tr>
<tr>
<td>4.</td>
<td>One Month Training Course on “Plywood Manufacturing Technology”</td>
<td>1 Month</td>
<td>Nov 01-30</td>
<td>23000</td>
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<tr>
<td>5.</td>
<td>Preliminary Bamboo Processing</td>
<td>3 days</td>
<td>Nov 27-29</td>
<td>11500</td>
</tr>
<tr>
<td>6.</td>
<td>Plywood and Adhesive manufacturing</td>
<td>3 days</td>
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<td>11500</td>
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**SHORT TERM TRAINING COURSES FOR SEP - DEC, 2017 AT MOHALI**

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**Programme Coordinator:** Mr. Amitava Sil, IPIRTI Field Station Kolkata, 2/2 Biren Roy Road (West), Sarsuna, Kolkata-61, Tele Fax:033-24983120, Mob:09874219758 (ipirtikolkata@ipirti.gov.in). Registration has to be done 10 days before the date of commencement of the course by remitting prescribed course fee. Fees payable to the organization may be sent by crossed Demand Draft in favour of Director, Indian Plywood Industries Research & Training Institute. You can apply online by filing and submitting the Registration Form.

* 18% GST
Although there exist many publications on technologies related to glue, wood adhesives, wood polymer and polymers for wood composites there is a need to bring out a comprehensive book which simplifies the matter for easy understanding and for commercial applications. The industrial personnel need the basic understanding on the materials used for resin manufacturing which are not available in hitherto published works. Based on Indian climatic conditions the manufacturing processes for panel products using different synthetic resins are to be optimized which are also discussed. This book is focused on indepth information about the raw material requirements for resin manufacturing which eventually reflects on the bond quality of the panel products.

The information presented in this book are based on research activities carried out at the Indian Plywood Industries Research and Training Institute (IPIRTI) and elsewhere as well as on the author’s experience in research and production of wood based panels with selected references cited under each section. Factors that affect the adequacy of the glue bonds are highlighted with necessary remedies to resolve the issues.

Keeping in view the research findings on the optimized synthetic resin formulations for making quality panel products that conform to relevant standards, the process of manufacturing phenolic and amino resins including the polyurethane resins have been described in detail. This book also covers the basic knowledge of analysing the purity of raw materials required and the analytical method of testing the resin quality. Plant and machinery for resin manufacturing, gluing faults and remedies for plywood and final finishing by putty are described with details.

**Price: INR 1500/-**

Interested persons may kindly send a DD for Rs. 1500/- in favour of The Director, IPIRTI, Bengaluru
संस्थान में हिंदी की गतिविधियाँ

• सितंबर 2017 को समाप्त तिमाही की हिंदी कार्यान्वयन समिति की बैठक दिनांक 14.8.2017 को आयोजित की गई।

• संस्थान में दिनांक 14.9.2017 से 28.09.2017 तक हिंदी पखवाड़ा मनाया गया।

• दिनांक 19.09.2017 को ‘हिंदी दिवस’ मनाया गया। श्री ईश्वर चन्द्र मिश्रा, अंतरराष्ट्रीय निदेशक, हिंदी अनुवाद ब्यूरो, भारतीय संस्कृति, कार्यालय, बंगलुरु में हिंदी कार्यालय का आयोजन किया गया। इसके अन्तर्गत हिंदी प्रशासनिक शब्दावली प्रतियोगिता, अंग्रेजी-हिंदी अनुवाद, प्रश्नोत्तरी प्रतियोगिताएं आयोजित की गईं। संस्थान के संयुक्त निदेशक, डॉ. मनोज कुमार दुबे ने हिंदी के महत्व को रेखांकित करते हुए कर्मचारियों को संबोधित किया। प्रेमी हिंदी अधिकारी, डॉ. विपिन कुमार चावला ने वर्ष 2016-17 की हिंदी रिपोर्ट प्रस्तुत की। कार्यालय में हिंदी में अधिकार काम करने वाले कर्मचारियों को भी प्रोत्साहन स्वरूप नकद पुरस्कार दिए गए।