

The editorial committee of the IPR newsletter wishes to thank all the IPR staff members for their encouragement and support that they have given to the revived newsletter. We hope that this will continue for all the forthcoming issues of "The Fourth State". Please feel free to send any comment / suggestion to the committee at <newsletter@ipr.res.in> for improvement of the look and contents of the newsletter. Thank you..

IPR @ Global R&D Summit

IPR participated in the Global R&D Summit organized by the Federation of Indian Chambers of Commerce and Industry (FICCI) and the Department of Science & Technology (DST) at New Delhi from 12-13 December 2014. As part of IPR's exhibits, several posters depicting the work being carried out at IPR, FCIPT and ITER-India were showcased. In addition to this, a scale model of the ITER cryostat base, two working models on plasma glow discharge and atmospheric pressure Plasma jet for the surface modifications/ medical applications were on display for the visitors.





Images of visitors interacting with IPR representatives at the R&D Global Summit

The summit was represented by P. K. Atrey and Ravi A V Kumar from IPR, Nirav Jamnapara, Akshay Vaid, and A. Satyaprasad from FCIPT and Dilshad Sulaiman and Shivakant from ITER-India. Apart from the exhibition, which was represented by DRDO, BARC, CSIR etc, there were panel discussions on R&D management and strategy, societal benefits of R&D and various other issues related to R&D in both private and public sectors in India.

नगर राजभाषा कार्यान्वयन समिति गाँधीनगर की तीसरी छमाही बैठक

नगर राजभाषा कार्यान्वयन समिति, गाँधीनगर की तीसरी छमाही बैठक 15 अक्टूबर, 2014 को उदयभानसिंहजी क्षेत्रीय सहकारी संस्थान, गांधीनगर में आयोजित की गई। इस बैठक में केन्द्रीय सरकारी कार्यालयों में राजभाषा हिन्दी के प्रभावी प्रयोग से संबंधित मुद्दों पर विचार विमर्श किया गया। इसके पश्चात् नराकास, गांधीनगर के सचीव नवीन कुमार यादव ने कार्यालयों से प्राप्त हिन्दी प्रयोग संबंधी छमाही रिपोर्टों की समीक्षा की । गाँधीनगर में स्थित केन्द्रीय सरकारी कार्यालयों, बैंक, स्वायत्तशासी संस्थान के प्रमुख सदस्यों ने इस बैठक में भाग लिया। आईपीआर के राजभाषा कार्यान्वयन समिति के अध्यक्ष एवं इंजीनियर एसएफ श्री राजसिंह, कनिष्ठ हिन्दी अनुवादक श्रीमती संध्या पी.दवे एवं इंजीनियर एसई व समिति सदस्य सुश्री प्रतिभा गुप्ता ने इस बैठक में भाग लिया। इस बैठक में नराकास द्वारा आयोजित सामान्य ज्ञान, आशुभाषण एवं गीत गायन प्रतियोगिता के विजेताओं को पुरस्कृत किया गया। इस अवसर पर सुश्री प्रतिभा गृप्ता को आशुभाषण प्रतियोगिता में तृतीय स्थान प्राप्त करने पर नकद पुरस्कार प्रदान किया गया।

नराकास, गॉधोनगर की इस बैठक में सचिव नवीन कुमार यादव ने बैठक में उपस्थित सभी सदस्यों से विचार विमर्श के पश्चात् नराकास, गाँधीनगर की गृहपत्रिका को प्रकाशित करने का निर्णय लिया है। इस पत्रिका का नामकरण शीघ्र ही किया जायेगा। इस गृहपत्रिका के लिए एक संपादक मंडल का भी गठन किया गया, जिसमें गाँधीनगर के सदस्य कार्यालयों के पाँच अधिकारियों को शामिल किया गया है। हमारे संस्थान की सुश्री प्रतिभा गृप्ता इस संपादक मण्डल की एक सदस्य है।



15 अक्टूबर, 2014 को नराकास, गाँधीनगर की तीसरी छमाही बैठक में उपस्थित सदस्य

News from ITER France

Conference / Training

Mr. Jashwant Sonara Participated in the 28th SOFT 2014 (Symposium on Fusion Technology) held at San Sebastian, Spain 29 Sept – 3 Oct, 2014

Dr. J Govindarajan attended the Laser Safety Management Training at Loughborough University, UK, between 13 – 17 October, 2014

Recently, India took possession of Cryostat Workshop Building built at IO site. IN-DA Delegation participated in the Project schedule Workshop at IO Head quarter. Project Director Shishir Deshpande and others, visited the facility for the first time.



ITER-India Director, Dr. Shishir Deshpande along with other members at the Cryostat workshop building at ITER, France



Indians residing in Aix-en-Provence and Manosque (ITER, France) organized a get together to celebrate Diwali festival on 27th October. It included lighting fire-crackers, cultural events, Dinner and in the end a group Photo. It is such annual events that enable all the Indians to get together with their family members.

IPR Outreach Programme @ Bhat Village

The first activity under the outreach programme of IPR for Bhat village kick-started on 13th October 2014. This 10 day course will train the local people in the basics of computer operation as well as data entry and usage of Microsoft Word in English and Guajarati languages. The first batch of 10 women from Bhat village completed their course on 30th October. The response to this programme has been immense with over 150 people (both men, women and children) from the village signing up for the programme which will be conducted in batches of 10. IPR computer center has installed five refurbished PC's at the Gram Panchayat building at Bhat village for this programme.



The first batch of students for the computer training programme, which was launched at Bhat village along with the trainer Mr. Royal Bhrambhatt, who is an intern working with the National Fusion Program at IPR.



Mr. Sunil Kumar joined the ICRH division of the institute in 1990 and has been instrumental in design and development of various RF amplifiers and oscillators for specific plasma experiments in Aditya and SST-1 Tokomaks and also for other research projects at the institute.

Silver Stars Of IPR



Mrs. Daljit Kaur Jashal joined the Institute in 1990, has been in charge of the reception and communication. She takes care of updating the staff details in PAST and E-office and deals with payments of bills for Official telephone connections and also involved in the security related screening of visitors. Mr. Raj Singh joined the Institute in 1990 and was responsible till the end of 2013 for the ICRH transmission line for Aditya and SST-1. Presently he is with the Microwave Plasma Division. He is also the chairperson of Official Language Implementation Committee (OLIC) at IPR.

Enhancement of Thermal Performance in the LN₂ Distribution System of SST-1

To improve the thermal performance and reduced the losses in LN_2 return distribution vent lines of cryogenic plant and NBI division of SST-1, we are replacing the old insulation (mineral glass wool) by compatible Polyurethane insulation (PUF) in tubes sections. We have checked the performance by running the NBI LN_2 system, no frosting was observed on the vent lines. During plasma experiment campaign, thick ice frosting usually occur on these vent lines.

Salient Features:

- PUF insulation materials class 'P' used which is compatible to LN₂ temperature fluid after comparison of different insulation materials and design calculations.
- Insulation used in 2 or 3 layers in 2 half section as per the pipe sizing with adhesive joints not coinciding each others, vapor barrier as polyethylene sheet and AL cladding.
- Performance tests for density (38.92 kg/m³ as per ASTM C 303), thermal conductivity (0.020 W/m-K as per ASTM C177), close cell content (96.725% as per IS 11239 Part 5), water vapor permeability (<2 % as per DIN 53428), compressive strength 0.12 N/mm2 as per DIN 53421) and dimension stability (at -25 °C -0.29 % and at 70 °C Nil) have been performed by the manufacturer and certificates obtained from National Laboratories.
- Thermal performance of the LN₂ systems may be expected to enhance 80-90%.



Frosting on the LN2 vent lines



Old glass wool insulation



New PUF insulation



On behalf of the Aditya Operation Team, Mr. Rakesh L. Tanna delivered an oral presentation on 16th October, 2014 at the 25th IAEA Fusion Energy Conference (IAEA-FEC-2014) held at St. Petersburg, Russia on paper title "*Novel Approaches for Mitigating Plasma Disruptions and Runaway Electrons in Tokamak ADITYA*" and presented a poster for the same paper by Mr. Rakesh L. Tanna and Dr. Joydeep Ghosh on 17th October, 2014.

Mr. Rajiv Sharma presented a contributed paper entitled "*Electrical Design Analysis and Breakdown Voltage Test Aspects of Indigenously Developed Electrical Breaks at Cryo Temperatures*" under the category of Surface discharge and flashover phenomenon" In 26th International Symposium on Discharges and Electrical Insulation in Vacuum (ISDEIV-2014) on 30 September 2014 at Nehru Center Mumbai Hosted by BARC and Indian Vacuum Society.







Dr. Mainak Bandyopadhyay of the DNB group gave an oral Presentation at the "Negative Ion Beams & Sources (NIBS) 2014 during 06-10 Oct 2014 held at IPP Garching. The topic of the presentation was "*Can we estimate plasma density in ICP driver through electrical parameters in RF circuit?* "

International Symposia on Discharge and Electrical Insulation in Vacuum (ISDEIV)

International Symposia on Discharge and Electrical Insulation in Vacuum (ISDEIV) was jointly organized by Indian Vacuum Society and Bhabha Atomic Research Center during Sept 28 - Oct 03, 2014 at Nehru Centre, Worli, Mumbai, India. IPR actively participated exhibiting current activities at IPR with 10 posters in a separate stall. International participants from countries like China, Russia, Germany, Japan, etc., interacted with IPR representatives on various developments and activities.



Delegates and participants at the IPR stall, ISDEIV Conference, Mumbai

हिन्दी प्रश्नोत्तरी प्रतियोगिता

गाँधीनगर की नगर राजआषा कार्यन्वयन समिति के संरक्षण में तटरक्षक क्षेत्र मुख्यालय (उत्तर-पश्चिम), गांधीनगर में 28 अक्टूबर, 2014 को हिन्दी प्रश्नोत्तरी प्रतियोगिता का आयोजन किया गया, जिसमें हमारे संस्थान के श्री राजीव शर्मा, इंजीनियर एससी एवं श्रीमती शिल्पा खंडकर, वैज्ञानिक सहायक ने भाग लिया। इस प्रतियोगिता में गांधीनगर में स्थित विभिन्न संस्थानों एवं संगठनों के अधिकारियों एवं कर्मचारियों ने भाग लिया। हमारे संस्थान के दोनों प्रतिभागी अंतिम राउण्ड में प्रवेश पाने के लिए हिन्दी भाषा पर आधारित प्रारंभिक स्क्रिनिंग टेस्ट में सफल हुए। अपने अच्छे प्रदर्शन के कारण श्रीमती शिल्पा



प्रश्नोत्तरी प्रतियोगिता में श्रीमती शिल्पा खंडकर एवं श्री राजीव शर्मा प्रश्नों का उत्तर देते हुए

खंडकर को उनकी टीम का प्रमुख बनाया गया। इस प्रतियोगिता में श्रीमती शिल्पा खंडकर (एवं टीम) को द्वितीय पुरस्कार और श्री राजीव कुमार (एवं टीम) को तृतीय पुरस्कार प्राप्त हुआ। कुल मिलाकर यह प्रतियोगिता अत्यंत रोचकपूर्ण रही।

Disposal Of Waste Using Plasma Pyrolysis Technology

A comparative study was performed on plasma pyrolysis process by disposing Mixed Solid Waste (MSW) in dry form and with moisture content. The main objective of the study is to analyse the temperature profile in the primary chamber and the consumption of graphite electrodes during the process. IGBT based DC power supply is used as the power source for the study. MSW used in the study mainly cotton, plastic and paper waste. The primary chamber is preheated before feeding the waste. Once the desired temperature is attained in the primary chamber, the system is operated for one hour with waste feeding to stabilize the process, subsequently data were collected. Initially dry MSW at the rate of 15 kg/hr is disposed and the temperature in primary chamber is noted in the regular interval. Similarly in the next experiment moisture containing waste is disposed at the rate of 15 kg/hr and the temperature in primary chamber is noted in regular interval. In both the experiments input power is kept constant at 25 kW. The table shows the actual temperature in primary chamber during the experiments at regular interval. The data obtained shown in the graph.



The MSW plasma pyrolysis system at FCIPT

Time in min	Temperature in Degree Celsius					
	Without Moisture	With Moisture (10%)				
60	746	664				
80	789	729				
100	881	742				
120	978	779				
140	996	803				
160	994	858				
180	1090	886				
190	1128	932				





Temperature raise in primary chamber with trend line

From the graphical representation it is clear that the rate of increase of temperature in primary chamber is less during moisture containing waste is disposed when compared to that of dry waste at constant power. It clearly shows that moisture waste requires more power in the primary chamber. The total graphite electrode consumption during the dry waste disposal is 22.5 mm/hr whereas for moisture containing waste it is 25mm/hr. This study clarifies that disposing the waste with moisture content demands more power and consumes more graphite electrode when compared to the dry waste. This leads to increase in the operational cost of the plasma pyrolysis process when disposing moisture containing waste. Hence waste with moisture shall be dried by using conventional methods like exposing to sunlight or using the hot gas from the process to dry the incoming waste which will increase the process efficiency and can reduce the operational cost of the process. This process is definitely going to contribute a great deal to the "स्वच्छ भारत अभियान" programme initiated by the Government of India.



Mr. Umesh N Savai, (on the right) along with Shri Harish Chandra Khanduri (Asst. Administrative Officer) administered the "Rashtriya Ekta Diwas" pledge to IPR staff on the birth anniversary of Late Shri Sadar Vallabhbhai Patel on 31st Oct 2014.

Acceleration Grid Power supplies for SPIDER and DNB

Acceleration Grid Power Supplies (AGPS) rated at 96kV, 75A for SPIDER facility and Diagnostic Neutral Beam (DNB) test programme are being manufactured in India. Major components of AGPS viz.

60kW water cooled Switched Power Supply (SPS) modules and 2.8MVA oil cooled multi-secondary transformers are presently being inspected at intermediate stages where Factory acceptance test for the first batch is scheduled by end of November 2014. The Manufacturing Readiness Review (MRR) was conducted early this year at ITER-India with participation of ITER Organization and the supplier for AGPS, M/s. Electronics Corporation of India Ltd (ECIL).



Assembly and testing of the SPS modules



Core Coil assembly of oil cooled multisecondary transformers

Past Events @ IPR

- Prof. Erich Griesmayer, CIVIDEC Instrumentation GmbH, Vienna, Austria, gave a talk on "Use of Diamond Detector Technology" on 30th October 2014
- Prof. Uriel Frisch, University of Nice, France, gave a talk on "Time-analyticity of Lagrangian particle trajectories in ideal fluid flow governed by the Euler equations: historical and modern perspectives" on 31st October 2014 (Colloquium # 239)
- Dr. Syaml Kumar Dana, CSIR-Indian Institute of Chemical Biology, Jadavpur, Kolkata, gave a talk on "Synthetic Genetic Oscillators, Quorum sensing and Multistability" on 7th November 2014
- Prof. Parameswaran Ajith, International Centre for Theoretical Sciences, Tata Institute of Fundamental Research, Bangalore, gave a talk on "Gravitational-Wave Astronomy: A New Window to the Universe" on 10th November 2014 (Colloquium # 239)

Upcoming Events

- CPP-IPR Workshop on Linear Tokamak Divertor Simulators for PSI Studies, Centre of Plasma Physics-Institute for Plasma Research (CPP-IPR), Sonapur 782 402, Assam, India, 24-26 November 2014 https://sites.google.com/site/ cppiprpsiworkshop2014/
- 29th National Symposium on Plasma Science & Technology and the International Conference on Plasma & Nanotechnology (PLASMA- 2014), Mahatma Gandhi University, Kottayam, Kerala, 8-11 December 2014 http:// www.plasma.macromol.in/
- Decennial IAEA Technical Meeting on Atomic, Molecular and Plasma-Material Interaction Data for Fusion Science and Technology, Daejeon, Korea, 15-19 December 2014 https://www-amdis.iaea.org/meetings/AMPMI14/
- 35th Annual Meeting and Symposium Fusion Energy: Recent Progress and The Road Ahead, Washington, USA, 16-17 December 2014 http://fusionpower.org/RegistrationForm.html

View of the IPR campus from the top of the ITER-India laboratory building



National Science Day - 2015 @ IPR

IPR, as part of the DAE Diamond Jubilee celebrations, is planning to host a 2 day Science Day event at IPR on 9-10 January, 2015. This event will see participation from local schools with science exhibits, various competitions including Essay writing, eloquence, poster painting and science quiz. There will also be several scientific models made by IPR staff. Preceding this event, on 8th January, IPR will host a Tech-Fest for engineering colleges in and around Ahmedabad/ Gandhinagar. This event will display scientific/engineering models made by them. The theme competition of this event will be "Robotics". All the exhibits of this event will also be on display for the Science Day event. Prizes and certificates will be awarded to the winners as well as participants.

IPR staff wanting to participate in these events are requested to contact any member of the Newsletter Committee. Wholehearted participation from all IPR staff would be required to make these events a grand success. The Science Day events will be open to general Public on both 9th and 10th January.

DAE Diamond Jubilee Popular Talk Series

As part of DAE Diamond Jubilee celebrations, IPR is organizing a series of popular lectures at Ahmedabad by eminent scientists. These talks are open to general public. The first in this series will be held at the H T Parekh auditorium, AMA building, Ahmedabad at 18:30 on 15th November, 2014.

The speaker will be **Padmashri Professor P. I. John** and the topic of his talk will be "*The Pervasive Plasma:* Socio-Economic Impact of Plasma Technologies".



Adieu

The Institute expresses its gratitude for the services of the following two person who are superannuating in the month of October 2014. On behalf of IPR, we wish them both a happy and healthy retired life.



Dr. Prakash M. Raole retired as Scientist-SG on 30th September 2014. He joined service on 8^{th} August, 1996 as Scientist SD at FCIPT.

Shri. Umesh N. Savai retired from IPR on 31st October, 2014 s Office Assistant-C. He joined service on 15-Nov-1988 as Office Clerk A in the accounts division.



From The IPR Archives



IPR Science Day - 1995. (Left) Research scholars M. Gupta, Hitesh Pandya and S. Mukherjee and faculty members Vinay Kumar and Amita Das (right image) setting up exhibits for the Science Day at IPR.

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