



Bharatiya Nirdeshak Dravyas: India's Scientific Breakthrough Boosting Manufacturing Sector

In an intricate world of science and technology, accuracy reigns supreme. Measurements act as the building blocks for innovation, dictating the quality of everything from life-saving pharmaceuticals to the sturdiness of bridges. For a nation like India, with its ambitious "Make in India" programme and a burgeoning economy, ensuring precise and reliable measurements is crucial. This is where the Bharatiya Nirdeshak Dravyas (BNDs) come into play, a revolutionary initiative that is transforming India's quality infrastructure landscape.

BNDs: The Guardians of Accuracy

BNDs, which translates to "Indian Reference Materials," are essentially Certified Reference Materials (CRMs) meticulously developed by the Council of Scientific and Industrial Research-National Physical Laboratory (CSIR-NPL). These CRMs act as benchmarks against which measurements made by instruments in laboratories across various sectors can be calibrated and verified. Imagine BNDs as the master rulers in a giant toolbox, ensuring that all the other measuring instruments are precise and consistent. NPL is also known as time keeper of India.



Prior to the advent of BNDs, India relied heavily on CRMs imported from other countries. This dependence posed several challenges. Firstly, the cost of acquiring foreign CRMs was significant, putting a strain on research budgets and hindering scientific progress. Secondly, the availability of these materials could be limited, causing delays in critical projects. Most importantly, the lack of a robust domestic CRMs programme hampered India's ability to fully control its quality infrastructure, a vital component for a thriving economy.

Recognising these limitations, CSIR-NPL took a bold step in 2017. They re-launched their CRMs programme under the brand name "Bharatiya Nirdeshak Dravya" (BNDs). This marked a paradigm shift in India's approach to scientific measurement. CSIR-NPL, being the National Metrological Institute of India with direct traceability to the International System of Units (SI), ensured that BNDs would be of the highest international standards.

The BND programme thrives on collaboration. CSIR-NPL partners with specialised Reference Material Producers (RMPs) who possess the expertise to develop BNDs for specific applications. This ensures that a wide range of BNDs are available, catering to diverse sectors like pharmaceuticals, petroleum, cement, and even water testing. The programme adheres to stringent international standards like ISO 17025 and ISO 17034 & 35, guaranteeing the utmost quality and reliability.

BNDs in Action: Empowering a Nation

The impact of BNDs is far-reaching. By providing cost-effective and readily available Certified Reference Materials, BNDs are empowering Indian laboratories to conduct more accurate and reliable testing. This translates to several tangible benefits:

- **Boosting "Make in India":** With BNDs readily available, manufacturers can ensure their products meet stringent quality standards, fostering trust in Indian-made goods.
- **Strengthening Exports:** Accurate testing with BNDs ensures Indian exports meet international quality requirements, opening doors to new markets.
- **Consumer Protection:** Reliable product testing with BNDs safeguards consumers by ensuring the quality and safety of goods they purchase.
- **Scientific Advancement:** BNDs empower researchers by providing them with the tools they need to conduct precise experiments and generate reliable data.



INTERVIEW

Prof. Venu Gopal Achanta
Director, CSIR-National Physical Laboratory



Q. How has the adoption of BNDs impacted India's scientific research landscape, particularly in terms of advancing indigenous manufacturing and ensuring global competitiveness?

A. Some of the BNDs are directly related to the calibration of scientific equipment like spectrometers including Raman, electron microscopes, atomic force microscope, force equipment, chromatography equipment among others. These are import substitutes for imported equipment as well as indigenous equipment. High purity chemicals, or chemicals with specific impurities of certified quantities are useful to perform control measurements and to calibrate the equipment. These help the indigenous development of force metrology equipment, Raman spectrometers, and breathe analysers among others.

Q. Could you elaborate on the collaborative process between CSIR-NPL and Reference Material Producers (RMPs) in the development of BNDs? How does this partnership ensure the diversity and specificity of BNDs for various industries?

A. In addition to the BNDs produced in-house at CSIR-NPL, a large number of BNDs are in fact produced in collaboration with reference material producers like cement BNDs with National Council for Cement and Building Materials (NCCBM), water BNDs with Aashvi Technologies, gold and silver with Jalan Jewellers, pesticides with Institute of Pesticide Formulation Technologies among others. We are currently producing BNDs in wide range of areas covering chemicals, to force measurement. These directly create business opportunities to the industry while providing quality assured certified reference materials to the country. These help reduce the foreign exchange loss on imports as well as meet the direct requirement of Indian industries.

Q. With the success and recognition of BNDs extending beyond India's borders, what strategies is CSIR-NPL employing to further enhance the global reach of BNDs, particularly in neighbouring South Asian countries?

A. We are promoting the BNDs are CRMs backed by the National Metrology Institute (NMI) of India that is CSIR-National Physical Laboratory. We partner with the accreditation body, NABL to publicise the BNDs in SAARC region. We also advertise these in the Asia-Pacific Metrology Program (APMP) region by presenting the BNDs available in India. We also publish in reputed international journals to establish the quality of BNDs.

Beyond Borders: The Global Reach of BNDs

The success of the BND programme doesn't stop at India's borders. The high quality of BNDs has garnered international recognition, with possibilities of exporting these CRMs to neighboring South Asian countries being explored. This not only strengthens India's position as a leader in scientific research but also fosters regional collaboration in the pursuit of scientific excellence.

A Glimpse into the BND Showcase: Real-World Applications

Here is a closer look at some specific BNDs and their transformative potential:

- **BND@ 2001: Alumina Powder** - This BND aids in calibrating X-ray diffractometers, instruments crucial for analysing the crystal structure of materials. Its applications range from research on new materials to quality control in the pharmaceutical industry.
- **BND@ 2004: For FTIR Spectrometers** - This BND ensures the accuracy of Fourier Transform Infrared (FTIR) Spectrometers, workhorses in chemical and pharmaceutical analysis. By guaranteeing precise readings, it helps ensure the quality and safety of medicines and other chemical products.
- **BND@ 2009: Magnification and Resolution Calibration (continued)** - This BND caters to the needs of Scanning Electron Microscopes (SEMs) and Field-Emission SEMs (FESEMs). These powerful instruments are used in research and development across various fields, from nanotechnology to materials science. The precise calibration facilitated by BND@ 2009 ensures researchers can obtain accurate images at the nanoscale, unlocking new possibilities for innovation.

Despite its remarkable success, the BND programme faces certain challenges. Maintaining a robust BND infrastructure requires continuous investment in research and development. Equally important is the need to develop a skilled workforce capable of operating and maintaining the sophisticated equipment required for BND production. Here's where initiatives like training programmes and industry partnerships can play a crucial role.

Collaboration for the Future: International Partnerships

International collaboration offers exciting opportunities for the BND programme. Partnering with research institutions from other countries can facilitate the exchange of knowledge and expertise. Additionally, participation in international programmes promoting the use of CRMs can further enhance the global recognition of BNDs.

Inspiring the Next Generation: Fostering a Culture of Scientific Accuracy

The long-term success of the BND programme hinges on inspiring the next generation of scientists and technologists. Engaging school students through interactive workshops and science fairs can spark curiosity about the importance of precise measurement. Additionally, developing educational resources that highlight the role of BNDs in scientific progress can nurture a culture of scientific accuracy that will benefit India for years to come.

The BND programme is more than just a scientific initiative; it's a symbol of India's growing scientific prowess and its commitment to building a robust quality infrastructure. BNDs are empowering Indian industries, safeguarding consumers, and propelling scientific research forward. As India strives towards a future driven by innovation and technological advancement, BNDs are poised to play a pivotal role in ensuring the nation's path to progress is paved with precision.

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