

Getting a Crush Over ION EXCHANGE BEADS

By Suzanne Sharpe

Water purification is the life source of many commercial and industry applications across the world, and ion exchange technology lies behind this process. To ensure high grade water reaches customers for their individual processing needs, care must be taken over the production and quality checking of ion exchange beads. Now, one manufacturer in India is using the very latest materials testing solutions in a novel, automated quality control procedure to safeguard bead quality and improve efficiency.

Water Purification

Ion exchange technology is used to purify water by removing heavy metals ions, such as Magnesium, Sodium, Calcium, Iron and Manganese and replacing them with less harmful ions such as hydrogen or hydroxide.

The build up of heavy ions leads to problems such as lime scale formation, which can block water pipes and sprinkler systems. Scale deposits on heating elements can also cause premature failing of water heaters. Purified water is a cost-effective solution because it helps businesses and consumers improve their water and wastewater consumption, and can be more easily recycled (an important factor in the paper manufacturing industry, for example).

Ion Exchange Beads

To facilitate the process of ion exchange, special columns have been developed, which are made up of thousands of tightly packed beads, each ranging from 0.3 to 1.2mm in diameter. The flow rates of water purification especially in condensate polishing are high, therefore the beads must be manufactured to a precise high standard in order to withstand the high compressive forces from the packing process in the column.

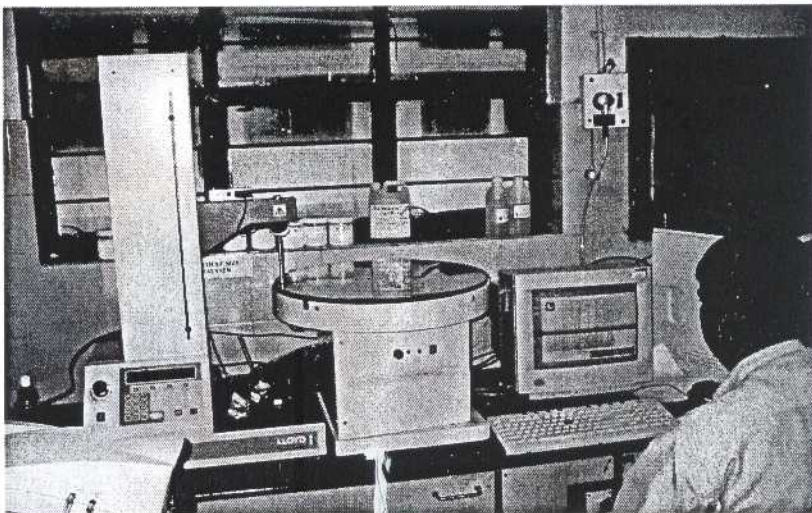
The Chemical Division of Thermax Pvt Ltd, based in India, is a leading manufacturer of ion exchange resins that exports to countries including USA, Japan and Taiwan. Checking the bead strength is part of the quality criteria for customers, who often test beads in batches of sixty at a time. Until recently, Thermax scientists would measure bead strength during a routine batch check by placing each bead on a glass plate and testing the compression forces at a speed of 1.2mm/min using a standard machine. Just a small batch of sixty beads could take up to two hours to test, and if any beads showed abnormal behaviour, additional beads would need to be tested until the required 60 beads pass the test leading to even greater time wasting.

The manual testing of each individual bead was clearly a time consuming and extremely inefficient process, so Thermax looked to a leading materials testing specialist for a more efficient and productive solution.

Manufacturing Requirement

Thermax needed a high performance testing machine that met the force criteria to test the crush strength of ion exchange beads, and one that was easy to operate on the production line. They also needed a solution that was flexible to meet their future testing requirements in both quality control and research, and remained affordable for their budget.

Thermax chose the LFPlus, an affordable, high performance single column universal testing machine from Lloyd Instruments for routine Test and Measurement applications and Quality Control. This advanced, 1 kN (225 lbf) tester is able to analyse the strength of many materials such as plastics, composites, rubbers, packaging, metals, springs, spot welds, joints, plastic film, electronic and automotive components, medical devices, paper, textiles, fasteners, adhesives and even food texture.



A modular design allows users to build a system that matches their exact needs and budget. Thanks to a 'Plug-and-Play' connection, it accepts XLC Series loadcells or hand-held CHATILLON® digital force gauges as the load measuring device, accurate to +/- 0.5% of the reading. Unlike other machines on the market, the LFPlus has a generous working area to test large sized samples. Other features include different configurable work surfaces, and independent or remote computer control with the company's NEXYGEN™ MT, easy to use software package.

NEXYGEN MT is the latest test and data analysis software control program from Lloyd Instruments. Based on the same Windows® user platform, it holds a vast library of international standard tests and specialist test set-ups for rapid results. Test data can be automatically exported to familiar Microsoft® packages for flexible and comprehensive reporting. The software also includes powerful security and data audit tracking features as well as video capture and playback for detailed research analysis or training.

Dedicated Testing Solution

As the official franchised distributor of Lloyd Instruments equipment in India, Hemetek Techno Instruments Pvt. Ltd. develops a close relationship with its customers, such as Thermax, by providing the right solution to meet a particular application. Hemetek carries a wide range of fixtures, grips and loadcells that fit onto Lloyd Instruments' test machines in order to test different materials and products. In this case, Thermax required a more dedicated solution and a special fixture was designed for the purpose.

To test ion exchange beads, Thermax fitted a 100N loadcell to the LFPlus machine. Hemetek engineers then designed a rotating table to accommodate up to 72 bead samples around the circumference. At the end of each test, the table rotates extremely smoothly without jerking to position the next bead ready for testing. This also ensures the probe on the crosshead can test each bead in the correct manner, for greater data accuracy. Since the test is carried out on the circumference of the jig, it was also vital to eliminate any side load effects on the jig movement after long use. Once again this ensured greater precision with each test.

The whole assembly weighs 120 Kgs to ensure stability, and the table movement is set at a fixed speed of 0.2 RPM to prevent any beads from flying off during the test. The jig also features a separate RS232 port for additional control through a PC, and provision was made for manual control of the jig, if required. Hemetek engineers also developed a dedicated bead compression test program, using Lloyd Instruments' advanced Ondio™ special application

builder software, which is also part of the NEXYGEN MT family of software.

Production Time Reduced

The overall bead testing time has now been reduced to 25 minutes, as opposed to up to two hours before – a staggering time reduction of almost 80%! Furthermore, this new automated set-up enables Thermax to redeploy manpower resources towards other tasks in the organisation. The software has also been designed to automatically reject any beads showing abnormal test results. This means the customer only gets results when a batch of sixty 'good' beads has passed, as per requirement. At the end of the test, the Ondio software automatically generates a report on the percentage of beads showing a crush strength of less than 150 gms, less than 200gms and the average strength of the 60 beads, along with a report for each individual bead. Once again, reports and data can be tailored made according to the needs and information requirements of the customer.

Future Requirements

Clearly, materials testing has come a long way over recent years and manufacturers are becoming more sophisticated in their desire to analyse product behaviour in greater depth. Whilst the design of ion exchange beads and columns continues to gather pace, it is vital for materials testing regimes to meet the needs of the manufacturer in the fast pace of production and quality control. Automation is set to increase, as instrument networking and machine control via Internet browsers may come to play an important role in the future. Whatever the requirement, greater efficiency and productivity, without compromising on accuracy, ease of operation or affordability will always be the key to ensuring quality products reach the customer every time.

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