Centralized Biochemical Screening at AstraZeneca: Thermo Scientific Nautilus LIMS™ Helps Improve Efficiencies in Information Management

With $26.5 billion in 2006 sales, AstraZeneca (AZ) is one of the world's leading pharmaceutical companies, focused on discovering, developing, manufacturing and marketing prescription medicines targeting cancer, cardiovascular, gastrointestinal, infectious, neurological, and respiratory and inflammatory diseases. Employing over 66,000 people worldwide, AZ is committed to sustainable development of its business, and the delivery of a flow of new medicines that make a difference in the lives of patients.

Thermo Scientific Nautilus LIMS™ has more than doubled the productivity of scientists conducting biochemical screening within one of AZ's secondary screening groups. "We increased our throughput from 2.5 to 6 assays per FTE [Full Time Equivalent]," said Roger Clark, a senior scientist within AZ's Biochemical Screening Team. This case study reveals how Nautilus LIMS was implemented at AstraZeneca to centralize biochemical screening and how it dramatically improved efficiency through superior information management.

The challenge: decentralized, manual process

In 2005, a UK-based AstraZeneca team began exploring the idea of centralizing global biochemical screening operations to service 50+ AZ bioscientists and chemists operating in R&D centers spread over four countries. Previously managed at the local laboratory level, the effort to record, track and manage a growing number of requests for compound screening was identified as a potential bottleneck in the centralization process. Since one person manually ordered and tested samples, then followed these through to results, they could reasonably manage just a few targets at a time. The productivity of 2.5 assays per scientist needed to be improved, and AstraZeneca set out to achieve this.

In building its business case, AZ focused on the decentralized, inefficient and manual process of biochemical screening. Key system requirements were identified and a variety of solutions were researched to deliver a system that could coordinate global requests, create automated workflows and standardize screening, ultimately accelerating the process.

"We knew exactly what we wanted from a system, but we weren't sure what type of software solution would work for us," said Roger, "Initially, we didn't even think of a LIMS for this project and started by exploring

bespoke solutions. When we decided to look at off-the-shelf products, we really liked what we saw in Nautilus because it seemed flexible enough to be configured for our exact needs."

About Thermo Scientific Nautilus LIMS: a flexible LIMS for research laboratories

First commercialized in 1998, Nautilus LIMS is designed to address applications that require more flexibility than traditional enterprise LIMS that serve QA/QC environments. Flexible and robust, with automated plate handling, instrument integration and easily configured extensions, Nautilus is the LIMS of choice for many research organizations.

The prerequisite for deploying Nautilus for AZ's Biochemical Screening Team was to significantly improve the management of compounds, reagents and the team's workflow – all in a single, discreet software solution.

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The results: rapid implementation and increased productivity

The Nautilus implementation began in January 2006 and was completed in April, just four months later. Within six months after deployment, the Biochemical Screening Team reported an exponential increase in productivity. The lab now achieves approximately 6 assays per FTE, up from 2.5 prior to centralizing the screening process. That is a 122% efficiency gain. With six researchers, the team now screens over 10,000 samples per month.

"The theory is that if we turn the data around faster and test across multiple targets, our chemists can get an answer more quickly. This can stop them from spending months going down the wrong route, therefore accelerating our research on promising compounds," said Roger.

Roger also noted that this speed should have the additional positive effect of saving the cost of chemistry and bioscience resources that would have been expended on a failed result.

Putting Nautilus to work

Due to the volume of samples and testing, one of the key criteria was that Nautilus interface to the existing AZ compound database. This was essential because all the data associated with each sample – oftentimes as many as 20 different attributes per sample – had already been entered into this corporate database and duplicate data entry was out of the question. AZ was able to configure an interface to Nautilus so that it simply reads the barcode label on each sample rack/plate, immediately transferring all associated information into the Nautilus database.

Once in the system, Nautilus' workflow functionality provides the testing instructions for each sample. While Nautilus' built-in plate functionality is quite robust, AZ had specific needs, which utilized the extension capabilities of the system. This allowed AZ to build upon standard Nautilus functionality using an up-to-date development language, Microsoft®.NET. The bespoke extensions required by AZ were implemented without delaying the "challenging timelines" established for the system deployment. "The ability to so easily extend Nautilus, given the correct programming skills, was a key selling point for us," said Roger.
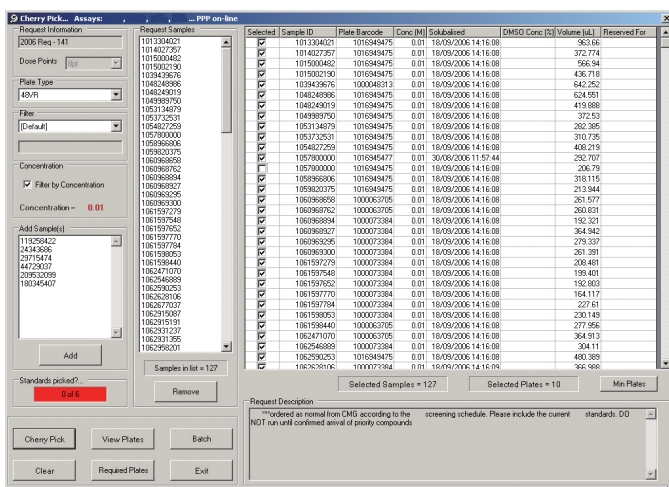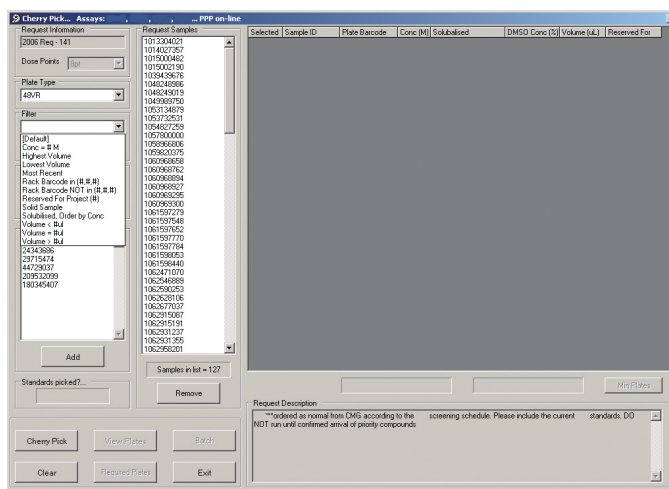

Fig. 1 AZ extension to Nautilus LIMS
"Cherry-Picking" of samples which match various (dynamically configured) criteria.

In addition to tracking samples, Nautilus is used to track and manage reagent stocks. Running several different assays with various components in each, AZ was intent on having the necessary reagents ready and available – so that they would not lose efficiency gains from centralized screening to poor inventory management. Nautilus is also able to help the lab measure and report on its productivity, generating statistics on such metrics as turn-around time.

"Fundamental to improving the efficiency of any process is the ability to capture metrics on Key Performance Indicators," said Roger. "As we are continually striving to do things more effectively, the reporting functionality in Nautilus is essential to us. Generating real-time statistics on the team's productivity allows our management to see an immediate and tangible benefit from their investment in the LIMS."
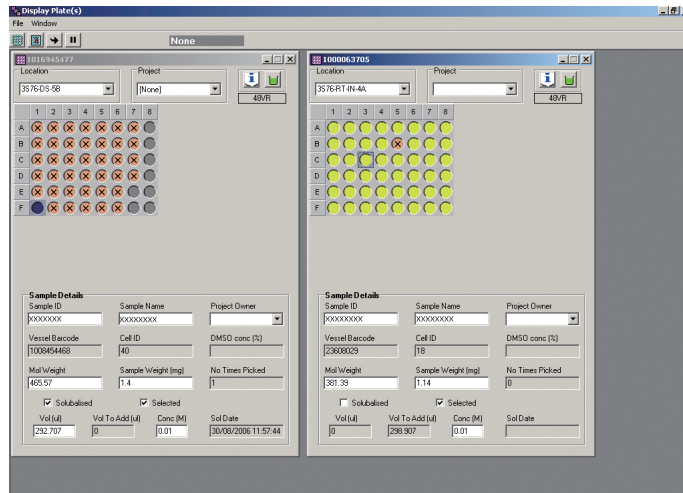
Nautilus' ability to add customer fields and tables into the Oracle database direct from within the application has proved invaluable to AZ as well. Once the system is deployed, any additional requirements for fields or tables can easily be built using the Nautilus Field & Table wizard, without having to wait for dedicated database administration personnel to become available. This allows the system to evolve as AZ's data requirements change.

Roger said the Nautilus interface was immediately appealing to the users because it is a Windows® Explorer-based system with familiar structure and organization of files. This greatly eased the learning curve, which was critical in meeting system deployment deadlines.

Nautilus provides an instrument interface as standard functionality, but also enabled AZ to integrate the LIMS with a list file to send instructions to the portfolio of instruments and robotics. By using a standardized 'csv' (comma separated value) file format, AZ can change out instrumentation as needed without having to configure new interfaces. Roger said that while the AZ Biochemical Screening Team took advantage of 50-55% of Nautilus functionality out-of-the-box, system extensions enabled them to achieve 95% of requirements.

Fig. 2 AZ extension to Nautilus LIMS
Once samples have been "Cherry-Picked" they can be graphically manipulated (moved on plate, moved between plates, solubilized, etc.).
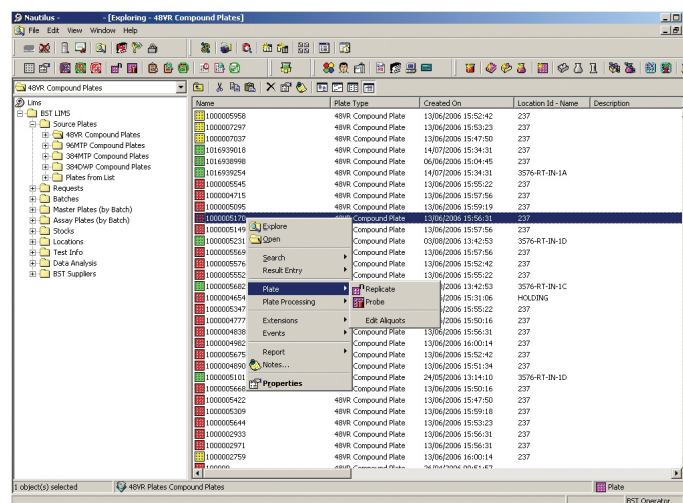

Fig. 3 Nautilus Explorer view
Various options are available through "Right-Clicking" on entities in the Nautilus Explorer.

AZ's Dr. Jon Wingfield, (Team Leader of BST), credits Roger's skill at configuring Nautilus as contributing to the successful deployment.

"Customers looking to follow our example of a successful, speedy installation should assign an internal LIMS project manager who has complete knowledge of the lab process as well as some IT experience," he said. "We've been able to streamline and adapt the workflow since the initial implementation and the knowledge that Roger gained while working alongside Thermo Fisher Scientific consultants, together with his considerable programming experience, proved invaluable in facilitating this evolution."

AZ was able to meet its requirements through easy configuration of the standard system coupled with bespoke extensions.

"The benefit in selecting Nautilus is its complete flexibility," Roger said. "This is absolutely critical for us, as there is a constant drive for efficiency and we want to be able to meet emerging business needs. We look forward to Nautilus allowing us to cope with completely new types of work, and to try things differently in the future."
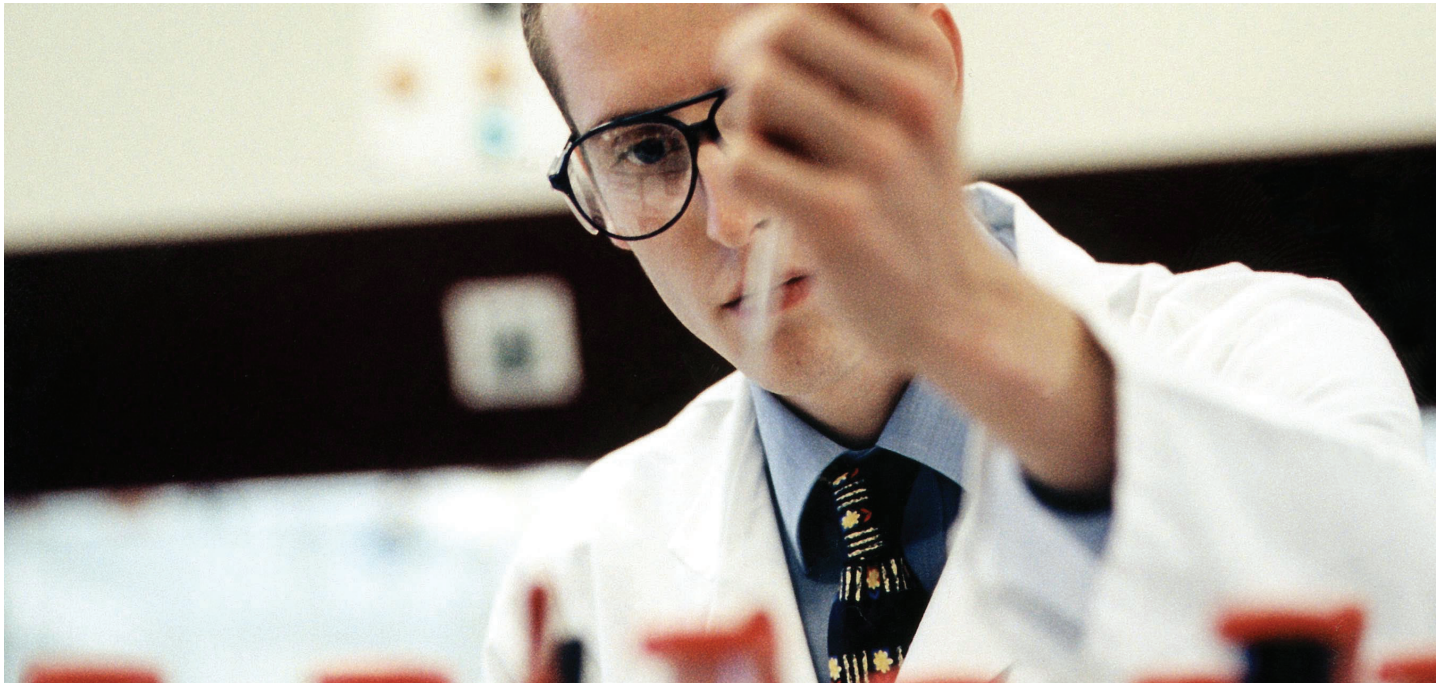
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Partnering with Thermo Fisher Scientific: a recommended supplier

With more than 20 years experience developing and servicing LIMS, Thermo Fisher Scientific was the ideal partner for AZ's centralized biochemical screening team. Roger said the tight timelines for the deployment meant he needed a vendor who could "assign additional resources, should timelines start to slip". A colleague from within AZ, where Thermo Scientific SampleManager LIMS™ is deployed, also "recommended Thermo Fisher as a reliable supplier."

Additionally, Roger said Thermo Fisher assigned "a professional, experienced consultant" to assist AZ from the very first meeting.

"From our perspective, there was no scope creep on our requirements," said Roger. "Thermo Fisher fielded personnel who could tailor the training, the deployment and the project to fit our needs. They had the professionalism and experience to look at our situation and lead us through the implementation. Working with Thermo Fisher, we were able to deliver a system that met the majority of our highly specialized needs, within a very challenging time-frame. The ability to extend Nautilus in .NET meant that I could further tailor the system to our exact requirements without impacting the 'Go-live' date."

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