

# An innovative automation solution creates a flagship integrated blood sciences unit

An innovative automation solution is described that has enabled the El Poniente hospital lab in El Ejido, Almeria, Spain to fulfil its obligations to the region of Andalusia. The laboratory has established an efficient network, transforming the diagnostics service to patients.

by Dr C. Avivar

In the last five years, the diagnostics service at the El Poniente Hospital Public Trust (El Ejido, Almeria, Spain) has seen its workload increase by more than 200 percent. In spite of this, its productivity is now amongst the highest in Andalusia, with the laboratory handling approximately 5.4 million individual tests annually. By 2009, the laboratory's productivity and workflow had even overtaken that of many of Spain's leading urban hospitals. This has been achieved by automating 90 percent of manual processes, delivering a consistent high-speed throughput and transforming the laboratory service into a fully integrated blood sciences diagnostic unit, which was officially opened a year ago.

For El Poniente, this was a pioneering project, recognising that the most suitable systems were offered not by one, but two companies, and inviting them to work together to deliver a "best of breed" total automation solution. This led to a unique collaboration between Beckman Coulter, Inc. – leaders in total laboratory automa-

tion – and the former Olympus Diagnostics, which has since been acquired and integrated into the global company [See text box].

The ever-expanding workload at the El Poniente laboratory in part reflects the economic prosperity of the region. Almeria is a rapidly expanding tourist area, with one of the fastest growing populations in Spain. In addition, El Poniente hospital itself has special responsibility within the modernised healthcare system being introduced by the regional government of Andalusia. Five years ago, the regional government began a multi-million Euro programme to transform medical services. This included the establishment of 22 'high resolution' hospital centres. 'High resolution' is defined as a comprehensive, fast-track medical service in a centre of excellence.

El Poniente's new role was to manage a network of five of these high resolution hospital centres. The hospital laboratory was required to provide the network with a centralised diagnos-

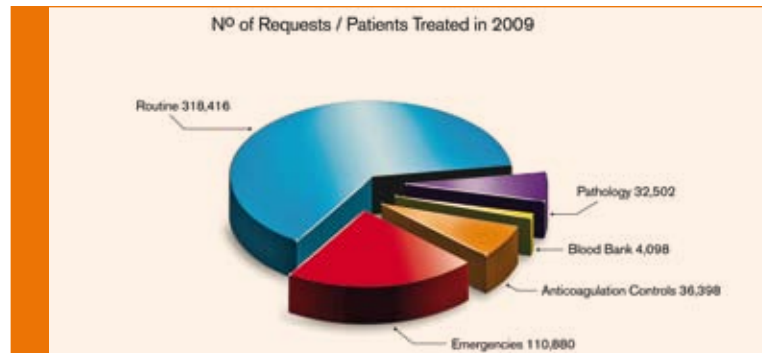


Figure 1. Number of requests treated in 2009 by the El Poniente laboratory.

tics service as part of this service. Being able to deliver a fast and consistent throughput for high-volume workloads was an immediate requirement.

## Complex testing demands

Two of the five new hospital centres managed by El Poniente have already opened with the laboratory providing an analytical results service to more than 240 different medical teams spread across the three hospitals and their catchment areas. The laboratory is able to carry out almost all of this activity in-house. Analysis of its laboratory's 2009 activity for three of the hospital centres shows that it handled 1,300,000 sample tubes (approximately 5,400 daily) with an average of 13 test requests per patient [Figures 1, 2].

These requests come from more than 800 different healthcare professionals, working in the three accident and emergency departments,

hospital inpatient and outpatient services, as well as the network's widely dispersed GP and primary healthcare centres. These make significant demands on the lab's workload, with test requests coming in from more than 100 different primary care sources. In addition, there are more than 60 extraction points within the hospital, and the laboratory also provides a decentralised anticoagulant service to all centres

By 2008, the increase in activity, together with the organisational demands of managing diagnostic services for the existing three hospital centres, required the laboratory to carry out a fundamental review of its service delivery. The laboratory also wanted to plan how it would handle further pressure on its workloads when the remaining two hospitals were added to the network. It set two prime goals – and the solution had to fit both equally well.

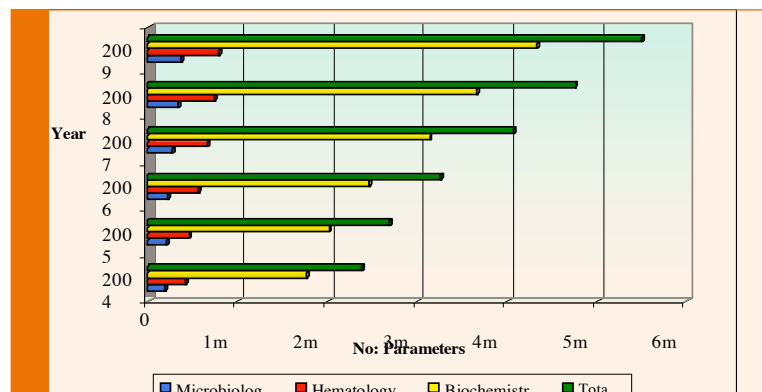


Figure 2. Five year increase in workloads, 2004 to 2009.

**Unique collaboration**

In 2009, Olympus Diagnostics' clinical chemistry products were formally acquired by Beckman Coulter and are now rebranded under that name. El Poniente laboratory was one of a number of laboratories in Europe where the two companies had been collaborating prior to the acquisition.

When Beckman Coulter acquired Olympus Diagnostics, it also acquired a manufacturing base in Mishima, Japan, further extending its worldwide capabilities. It has also acquired the previous company's flagship European research and development centre in Munich, Germany. Globally, this means the company has a new and expanded infrastructure — with manufacturing and R&D capabilities as far afield as the US, Japan, Germany and County Clare, Ireland.

First, the lab knew that it had to automate and streamline the majority of its manual processes to maintain a consistent workflow. Second, an analysis of the requirements of the medical professionals confirmed that the preferred solution would bring together the separate areas of clinical analysis, biochemistry, haematology and haemotherapy, microbiology and pathology into one, combined blood service facility.

When assessing likely automation partners, key selection criteria prioritised the following: analyser speed, technology that delivered innovation and robustness, chemistry and immunoassay reagent quality, plus a high-speed, high-throughput pre-analytic capability. In addition, the lab had to demonstrate an overall improvement in organisational efficiency that would facilitate future expansion. Improving sample management and laboratory processes without increasing running costs was also critical.

### Winning staff cooperation

Automating the different laboratory processes and disciplines and consolidating them into one integrated unit can be particularly stressful for staff, requiring a more flexible working approach from everyone. Reducing the time spent on unproductive manual tasks has the potential to offer new challenges and an improved working environment. However, new skills must be acquired and staff have to be willing to adopt multitasking across several disciplines. The solution therefore had to involve investment in retraining, to ensure the staff could understand and adapt quickly to this new model for laboratory work.

### High-speed sample sorting

From the moment samples enter the laboratory, technology automates their handling and sorting. This provides a fast and consistent response to test requests, regardless of fluctuating workload pressures or the differing requirements from hospital or external centres.

The high-speed AutoMate 2550, with aliquot capability, can handle 1,200 samples per hour. It provides the crucial first step in helping the lab successfully achieve its current performance levels. A second sorter, the AutoMate 1250, provides additional support when needed. With aliquot capability, the 1250 can handle 800 samples an hour.

Pre-analytical processes such as decapping, preparation of

selected aliquots and the sorting and distributing of samples to the appropriate work area or analyser, have been automated. Staff are no longer required to handle samples, which helps to eliminate potential hazards associated with manual handling.

Once sorted, most of the samples are sent to the fully automated core lab. This is where the Beckman Coulter Power Processor system progresses the samples along

a continuously moving track to the interconnected chemistry and immunoassay platforms.

PrepLink, the computer management software for track automation, controls all functions —automatically sharing information with the laboratory information system (LIS). The software tracks the progress of the sample as it moves through the pre- and post-analytical stages, in real time.



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### What automation delivers

- Reduced turnaround time (TAT)
- Elimination of most manual tasks
- Minimisation of sample handling errors
- Simplification of processes
- Consolidation of parameters
- Improved quality and safety
- Ability to locate samples faster & efficiently
- Increased analytical productivity and coordination of work
- Enhanced working practices and staff job satisfaction

### High-volume analysers deliver workflow efficiency

The Power Processor automates routine, time-consuming manual tasks such as initial sample entry onto the system (via an inlet module), centrifugation and cap removal — presenting samples to the analysers, and then transferring them for the next processing step. Two high-speed centrifugation systems are linked to the track, each with 40-tube capacities, capable of spinning 450 tubes an hour.

The automated track connects two Beckman Coulter UniCel DxI 800 immunoassay analysers, able to run up to 400 tests an hour for high-speed chemiluminiscent analysis. Workflow is maintained because reagents can be added while the analysers are running. The DxI 800 has an extensive menu, including anaemia and cardiac tests, hormone profiles, tumour markers and an expanded range of routine immunoassay tests that are required daily.

The lab has specific high-volume clinical chemistry requirements. It needs an overall system with a moderate footprint that is still capable of delivering an hourly maximum throughput of approximately 8,000 tests when all the analysers are connected to the Power Processor. The AU5420 and AU2700 clinical chemistry analysers more than meet these requirements and link seamlessly to the Power Processor. As a result of the acquisition of Olympus Diagnostics, these systems are now part of the Beckman Coulter family of products.

An automated refrigeration unit is an efficient way of storing samples for high-volume laboratories. As test requests are completed and tubes automatically recapped, the track directs them without manual intervention to Beckman Coulter's 3,060-capacity refrigerated storage unit. Once stored, samples needed for add-ons, reruns and reflex testing are easily located by PrepLink. It automatically identifies the patient via a bar code, and retrieves the sample within seconds

so that it can be directed to the appropriate analyser.

### Conclusion

The innovative collaboration between Beckman Coulter and Olympus Diagnostics has been instrumental in supporting the El Poniente laboratory in the fulfilment of its obligations to the region of Andalusia. It has enabled the laboratory to establish an efficient network, transforming the diagnostics service to patients as well as the professional teams caring for them. Alongside this high standard of technology, the teamwork of laboratory staff and the efficiency of the new organisational structure deliver a framework for further expansion of the lab's new integrated blood sciences service.

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