Hermes Pardini redefines operational excellence for extreme high-volume testing

Enterprise-wide project leveraged diagnostics, automation, and IT to transform testing of >260,000 tubes per day in Brazilian reference laboratory

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Case Study

Strategic Partner

Laboratory Automation

inpeco

SIEMENS Healthineers

In Vitro Diagnostic Testing Enters a New Era

Welcome to a Mega-lab

In 2018, Hermes Pardini SA embarked on an important project to update the organization's enterprise-wide diagnostic testing infrastructure. It operates a very-high-volume reference laboratory, and its main site, located in Minas Gerais, Brazil, is among the largest diagnostic testing laboratories in the world.

Pardini's core lab and 10 satellite locations process more than 260,000 tubes each day to generate more than 14 million test results each month. Offering a menu of more than 6000 different assays, the 63-year-old company serves as a reference lab to more than 6000 client laboratories located in more than 2000 cities across Brazil. More than 86,000 patients depend on Pardini for fast and accurate test results each day.

The biggest operational challenge Pardini faced was the highly segregated nature of the existing operation and the complexity of performing high-volume testing on different platforms with low turnaround time (TAT) and high accuracy. Despite adopting task-targeted and early track-based automation solutions, Pardini still relied heavily on inefficient, labor-intensive batch processing across four separate tracks and more than 20 stand-alone instruments. Data-driven workflow analyses by Healthcare Consulting Solutions experts at Siemens Healthineers determined that the staff loaded tubes for analysis at 20 different locations and could re-sort each of the average 120,000 tubes received each day up to 11 times.

A big project with big goals

The Pardini project team set aggressive goals for a technological evolution that would leverage the lab's existing footprint to increase throughput, accuracy, and sustainability while reducing TAT and operational costs. They sought a standardized instrument family for their rapidly expanding satellite organization: analyzers that offered flexible, scalable, reproducible production models that could readily accommodate future growth. This new testing infrastructure—with seamlessly integrated IT—would drive a new model of excellence and transform Hermes Pardini SA to the future of diagnostic laboratories.

In addition to achieving the desired end-state for this mega-lab, the project itself needed to be managed in a way that supported ongoing operations during implementation.

"The Enterprise Project was carried out through an innovative partnership between Pardini Group, Siemens Healthineers, Inpeco, and other suppliers that resulted in a new production model for laboratory medicine. This production model proved to be the best alternative for performing laboratory tests in high volume, with low turnaround time, addressing all traceability and quality requirements for lab production."

Dr. Guilherme Collares
Chief Operations Officer
Hermes Pardini SA

Goals	Achievements*
Improve TAT performance	>96% of results within 6 hours. This represents a 37.5% improvement in TAT.
Increase production capacity	Achieved throughput of 184,000 tubes/day on the track at operating peak, with an average load of 168,000 tubes per day on the track.
Save time	77.5% fewer tube touches through the full lab process, contributing to >5000 hours/month time savings.
Enhance performance reliability	Achieved >97.5% uptime for Atellica® Solution instruments and automation components.
Improve quality	Reduced repeat testing by 34%.
Alleviate staffing challenges	Increased workforce productivity by 37%, with reports of improved team engagement and better skill utilization.
Help ensure sustainability	Reduced water consumption by 32% to save 505 liters/hour

**Performance data provided by Hermes Pardini SA based on pre- and post-automation performance measures as of August 2021.*

Strategic Partners Offer Innovative Technologies to Optimize Workflows

Working together, Siemens Healthineers and Inpeco offered Pardini a portfolio of innovative technologies that combined game-changing diagnostic analyzers, very-high-throughput open automation, and innovative IT. More importantly, the automation partners demonstrated a deep understanding of how to best leverage such high-powered hardware and deliver the custom configurations needed to meet the project's stringent demands.

"The Siemens Healthineers and Inpeco teams took some time to propose a configuration. Rather than jumping to a familiar solution, they first conducted a series of extensive workflow analysis workshops with Pardini personnel that focused on streamlining workflows both on and off the automation track," said Raphael Paulino, process engineering manager.

"Siemens Healthineers and Inpeco proposed a novel solution: to connect two individual high-throughput tracks via an elevated bridge. This would not only enable us to meet increasing demand and lower costs, but it would also enable us to maintain existing operations throughout the project implementation," said Raphael Paulino, process engineering manager.

Orchestrating a transformation while maintaining operations

Expertise in large-scale project planning and management was critical to success. The project needed to be completed without service disruption while the site ran at full production capacity. Some 180 tons of equipment that comprised the new Total Lab Automation (TLA) solution would need to be installed in the same footprint as the site's four legacy tracks and stand-alone instrumentation.

More than 400 people from 32 countries participated in the project. Initially, Atellica® Solution analyzers were installed and placed in the lab in the position they would occupy in the final TLA solution. After validation work and operator training, the lab staff used the analyzers' front-loading capabilities to perform Pardini's ongoing testing. This allowed for decommissioning of the lab's legacy instruments. Two FlexLab™ for High Throughput tracks and four high-volume storage modules were constructed around the analyzers. Stand-alone production work was introduced onto the track in a 5-phase plan along with management of sample, result, and QC data using Atellica Diagnostics IT systems and the IT Control Center.

As a strategic partner to Pardini, Siemens Healthineers continues to provide standard and highly customized services including teamplay Fleet, service level agreements, and 7/24 on-site staff, inventory, and part support to ensure Pardini's long-term success.

The Multifaceted Solution

Dual-track design meets mega-lab demand

Pardini now performs one-touch, automated, multidisciplinary testing across two connected FlexLab for High Throughput tracks with 116 pre- and post-analytical processing modules and 102 analyzer modules from multiple manufacturers. The solution is designed to accommodate additional analyzers and/or automation spurs for future growth.

The 330-meter total laboratory automation solution supports a testing menu of >1000 assays to analyze an average of 108,000 tubes per day as well as prepare and sort another 60,000 tubes per day for off-track testing elsewhere at the central site.

To optimize both on-track and off-track workflows, a custom-designed bridge connects two FlexLab for High Throughput tracks that feature mirrored-instrument and assay configurations. With a combined track throughput of up to 20,000 tubes per hour, the dual-track solution features redundant high-volume refrigerated storage and disposal modules with a total capacity of 1.38 million tubes. The bridge saves operator time, meets fire regulations and requirements, allows transport of tubes between tracks, delivers sorted samples to the output module nearest to the next testing destination, and allows easy pass-through for staff as they move through the 4000 ft^2 core lab.

Powerful platform anchors diagnostic testing across the organization

Atellica Solution supports 54% of the track-based testing. Integral to meeting the lab's TAT goals, its game-changing, flexible design delivers high throughput in a small footprint with less hands-on time for lab staff. The 60 individual chemistry and immunoassay analyzer modules are connected to each of the tracks via 20 sample handler interfaces. Pardini also uses several different stand-alone Atellica Solution configurations at seven satellite labs in São Paulo, Rio de Janeiro, Goiânia, Fortaleza, Itajaí, Belém, and Belo Horizonte to standardize reagents and instrumentation across the entire organization.

Integrated IT improves productivity

Atellica Data Manager software supports standardized testing, rules-based automatic reruns, and QC management across the TLA. "We've instituted a number of advanced workflow rules that streamline production and help avoid errors," said Dr. Junia Pérez, production executive manager. For example, Pardini uses a combination of Atellica Data Manager and automation rules to route samples to designated instruments based on carefully defined dilution requirements. This approach eliminates manual contact for enhanced staff safety while simultaneously streamlining and automating testing workstreams required for improved productivity.

Likewise, IT rules direct sample management for tubes with specimen integrity issues related to hemolysis, icterus, and lipemia (HIL). These samples will not be tested. After being automatically evaluated and flagged by either a newly developed HIL Sample Inspection module and/or an Atellica CH Analyzer, testing orders are canceled to avoid errors and the need for repeat testing. Instead, data-driven IT rules route tubes to an error lane on the Input/Output Module of the automation track to speed the time it takes for lab technicians to react.

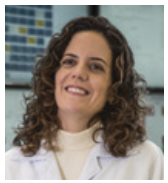
Overall operations are managed in a centralized Command Center, where computers provide processing information for all samples on the automation track. Atellica Process Manager software delivers real-time visibility and can support remote control of production for a large part of this workload. In the future, the Command Center will also provide visibility to Pardini's laboratory information system as well as Atellica Solution and third-party instruments located at the satellite sites.

Elevated bridge connects nearly identical tracks to meet throughput requirements

The design meets throughput requirements of a mega-volume lab and ensures redundancy for high-volume testing. Inter-track tube transfer supports testing with very-low-volume assays that are only available on one of the tracks.

Customized high-volume refrigerated storage

Four custom-designed Refrigerated Storage Modules offer a combined capacity of 1.38 million tubes. The connected refrigerators store sealed samples at a customized temperature of 2–8°C and enable automated access and retrieval to any sample, without the need for manual intervention.



"The Atellica Solution is the main platform on our track. Its configuration flexibility and convenient operating features, along with all the track functionalities, allowed Pardini to improve the entire workflow, lowering turnaround times, FTEs, and total cost of ownership while delivering a broad assay menu with a high standard of quality," said Dr. Junia Pérez, production executive manager.

Pre- and post-analytical modules:
Bulk Input Module (14)
Input/Output Module (14)
Wide Belt Buffer (600) Module (10)
Sample Integrity Module (20)
Universal Shaker Module (2)
Decapper Module (16)
Sealer Module (16)
Desealer Module (4)
Aliquoter Module (2)
Recapper Module (2)
High Volume Storage (4)
Over-Underpass Module (1)

Siemens Healthineers instruments:
Atellica® Chemistry Analyzer (18)
Atellica® Immunoassay Analyzer (42)
BN™ II System (2)
IMMULITE® 2000 XPi System (6)
Sysmex® CS-5100 System (2)

Third-party instruments:
ALINITY I system (14)
D100 system (8)
LIASON XL system (4)
EC3 system (4)
COBAS e 801 system (2)

Future instruments planned:
PHADIA 2500 system

Enhanced QC

Patient moving averages are continuously tracked to monitor assay performance. Atellica Data Manager uses this real-time trending data to automatically disable testing for at-risk assays until a quality analyst can take action. This gives the Quality team more time to thoroughly investigate issues for greater safety.

Result management

Advanced rules for autovalidation and reflexive and repeat testing have been implemented to automate decision making and speed results. Atellica Data Manager has streamlined testing across disciplines, even for more-specialized testing such as hemostasis. Customized rules enable track-based testing for 45% of the site's hemostasis testing. If required, subsequent clotting tests are automatically determined and performed based on the patient's other results or a reference result from human pooled plasma. In specific situations, the sample will be sent to an output rack for manual review.

Real-time centralized monitoring and business analytics

All diagnostic instruments and automation modules are remotely monitored via a customized 3D view of the lab in the Atellica Process Manager software. When alerted to a potential error, the Command Center staff immediately notifies the lab technician responsible for the flagged module or instrument for immediate verification and resolution. This helps optimize operations and minimize low-value tasks for staff in the core lab.

Among Atellica Process Manager's many analytical tools, the Command Center team also uses information contained within the Automation Utilization Report to direct the ongoing activities of the core lab staff. Siemens Healthineers developed a customized dashboard for the mega-lab to provide turnaround time statistics, sample error counts, reagent and instrument utilization information, and other key performance indicators collected from the real-time, out-of-the-box analytical reports included with the software.

Key Outcomes*

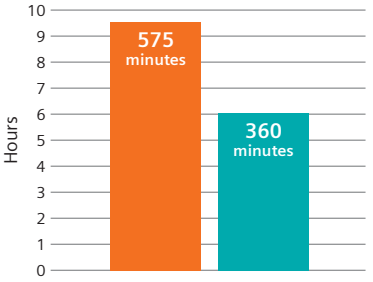
The project, completed in 2020, redesigned the entire core lab to significantly reduce wait states/times, process waste associated with manual tube touches, and unnecessary movement associated with pushing trolleys and transporting tubes throughout the 4000 ft² main laboratory. It brings one-touch workflow, increased quality, and lower TAT to one of the world's largest single-site core labs. "Not only did we meet all our design goals for the project, but we also saw a 48% reduction in customer complaints," said Dr. Junia Pérez, production executive manager.

Ushering in a new era

For a growing segment of mega-labs around the world—labs that perform very-high-volume testing—operations have truly begun to resemble those of a factory. Despite a natural desire to take an industrial approach, patients' lives are at stake, and therefore clinical excellence and quality remain critical. These ideals are at the core of the solution designed and delivered by Siemens Healthineers and Inpeco SA.

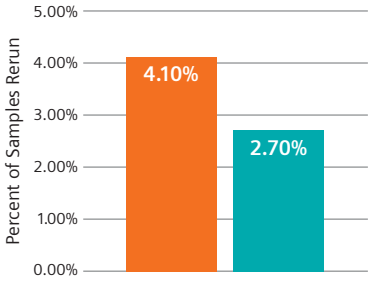
Combining Atellica Solution diagnostics, FlexLab for High Throughput automation, and Atellica Diagnostics IT, the implemented solution significantly improves the operational performance of Pardini's main testing site and standardizes satellite operations across the organization. From the enormous TLA solution and centralized IT Command Center at its main lab to the standardized instruments and result management approaches being implemented across its growing network of satellite locations, Hermes Pardini SA epitomizes what the future of diagnostics may look like.

Decreased Turnaround Time by 37.5%*



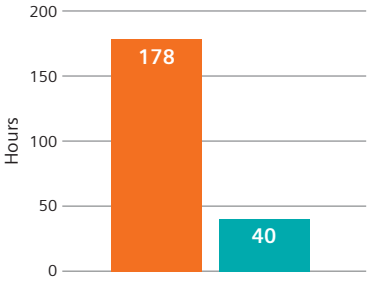
More than 96% of daily results meet the <6-hour turnaround time goal at the mega-volume Pardini reference laboratory.

Reduced Repeat Testing by 34%*



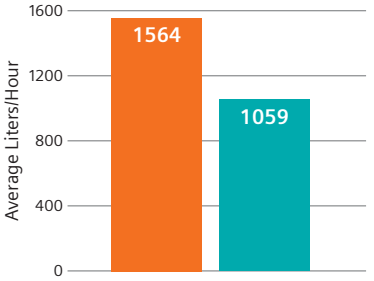
Automation, enhanced QC tools, and data-driven operational rules have reduced errors. The lab follows strict confirmatory testing protocols that comprise the majority of current repeat testing.

Reduced Tube Touches by 77.5%*



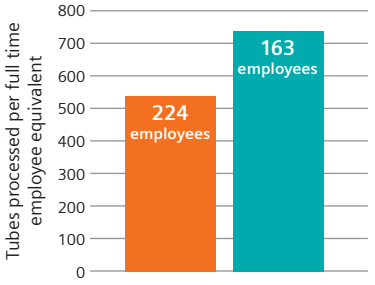
Combining multidisciplinary testing and sample preparation moves the organization closer to the possibility of one-touch testing.

Reduced Hourly Water Consumption by 32%*



The automation solution enables Pardini to conserve 505 liters/hour

Increased Workforce Productivity by 37%*



Fewer Hermes Pardini SA employees support processing of 120,000 tubes/day with the automation solution in place.

Before After

Performance data provided by Hermes Pardini SA based on pre- and post-automation performance measures as of August 2021.

At Siemens Healthineers, we pioneer breakthroughs in healthcare. For everyone. Everywhere. By constantly bringing breakthrough innovations to market, we enable healthcare professionals to deliver high-quality care, leading to the best possible outcome for patients.

Our portfolio, spanning from in-vitro and in-vivo diagnostics to image-guided therapy and innovative cancer care, is crucial for clinical decision-making and treatment pathways. With our strengths in patient twinning, precision therapy, as well as digital, data, and artificial intelligence (AI), we are well positioned to take on the biggest challenges in healthcare. We will continue to build on these strengths to help fight the world's most threatening diseases, improving the quality of outcomes, and enabling access to care.

We are a team of 66,000 highly dedicated employees across more than 70 countries passionately pushing the boundaries of what's possible in healthcare to help improve people's lives around the world.

Product availability may vary from country to country and is subject to varying regulatory requirements. Please contact your local representative for availability.

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Published by
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Published by Siemens Healthcare Diagnostics Inc. · 30-22-DX-1600-76 · HOOD05162003311022 · 12-2022 · ©Siemens Healthcare Diagnostics Inc., 2022