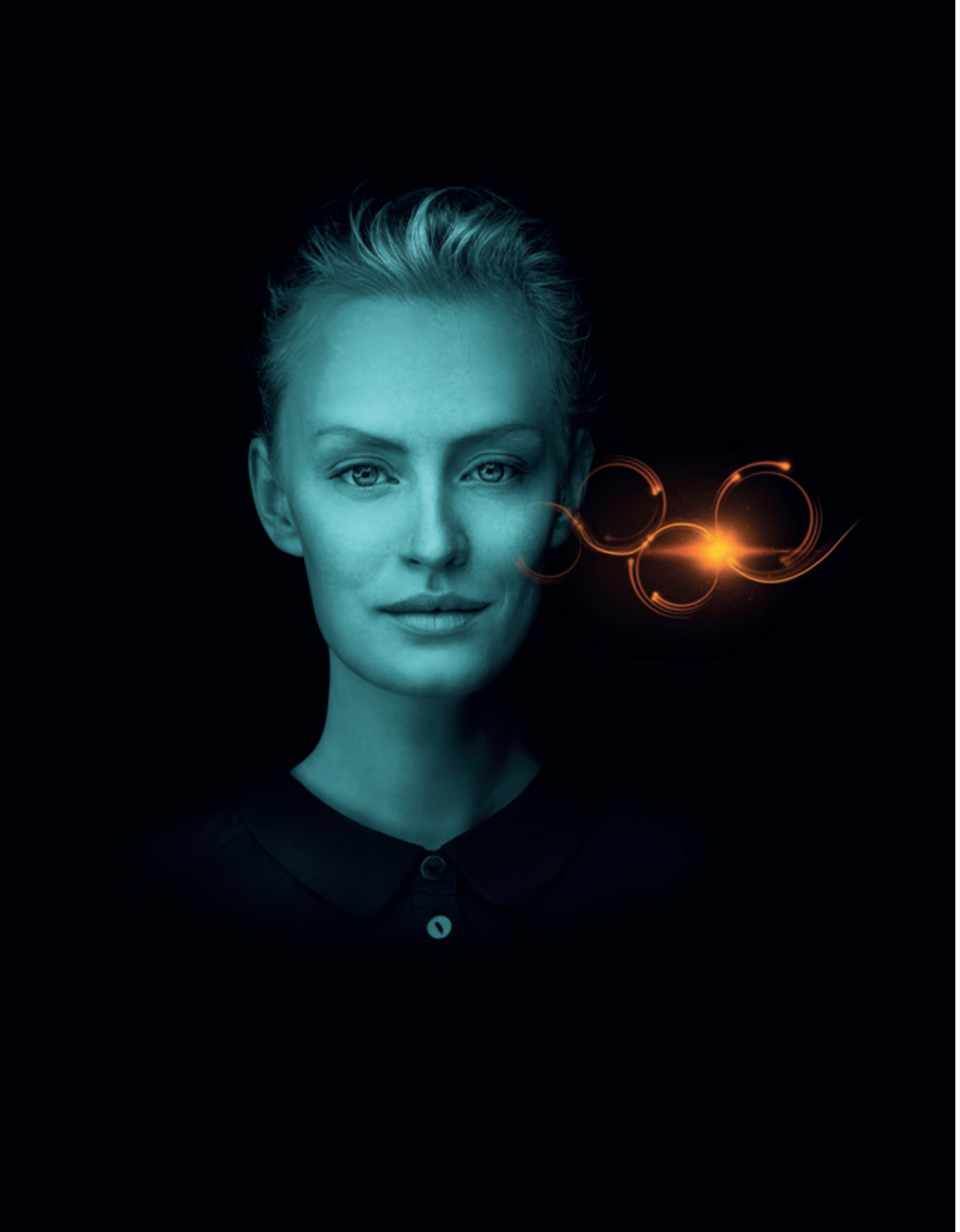

Taking efficiency and productivity to new heights with

Aptio Automation

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Case Study

SIEMENS Healthineers

The CHwapi laboratory at a glance

- **Two sites merged:**
  Dorcas and Notre-Dame
- **Staff:**
  5 biologists, 42 technologists,
  12 secretaries, and 11 couriers
- **Activities:**
  Biochemistry, immunology,
  hematology, coagulation,
  microbiology, and molecular testing

Consolidating and automating two laboratories in a quest for optimal quality, cost-effectiveness, and workforce management

About 297,000 consultations and up to 24,500 hospital admissions: Every year, no fewer than 321,500 people find their way to the CHwapi center. Short for Centre Hospitalier de Wallonie picarde, it comprises four separate sites in Tournai (Belgium). Two of these—Dorcas and Notre-Dame—had their own laboratories, handling several hundred test tubes a day. When the two labs decided to join forces, the need for a complete, automated analysis track was beyond dispute. In 2014, the hospital center called in Siemens Healthineers to take the plunge toward total lab automation.

"We knew that we needed to automate as many processing tasks as possible in order to handle the growing number of laboratory requests," explained Dr. Jean-François Marchal, lab director at CHwapi. "Once our two laboratories merged, we would have to cope with a 50% increase in activity. We wished, however, to maintain or even improve our overall turnaround time. Obviously, this could only be achieved by eliminating numerous manual tasks, like aliquoting and centrifuging test tubes. In addition, reducing manual work would also help us rule out various human errors and make better use of our staff's talents, for technical validation jobs and quality checks, for instance. And last but certainly not least, we wanted to be able to trace every single test tube from arrival to storage, during each step in the analysis process."

"With Aptio® Automation, we not only integrated two separate laboratories, we also consolidated four laboratory disciplines in a single automation track. This offers a legion of benefits. We automated numerous manual processing tasks, which enables us to make better use of our staff's talents. We optimized our turnaround time and reduced our cost structure. And all of this helps our hospital center to take care of its patients even better."

Dr. Jean-François Marchal | Lab Director at CHwapi

Two separate labs, rolled into one automation track

The CHwapi laboratories chose Aptio® Automation for the job. But deploying this automation track at the Notre-Dame site posed several engineering challenges. "At Dorcas, we didn't have an integrated track, just stand-alone analyzers," Dr. Marchal commented. "From prepping and storing test tubes, to centrifuging, aliquoting, and introducing them onto the appropriate analyzer, the entire test tube handling process had to be carried out manually."

At Notre-Dame, on the other hand, a smaller ADVIA® WorkCell® track without centrifugation and aliquoting handled the biochemistry and immunology testing. "These tracks were already programmed in CentraLink® Data Management System," added Mr. Jean-Jacques Parez, biologist at CHwapi. "For the sake of cost-effectiveness, we wanted to integrate our current systems and the new systems for hematology, biochemistry, immunology, and coagulation testing into one single, comprehensive automation track. Siemens Healthineers was able to offer this level of flexibility."

The CHwapi laboratory reaps the benefits of a comprehensive automation track that combines hematology, immunology, and coagulation testing. It also contains modules for pre- and post-analytical tube-processing tasks, ranging from sealing and desealing to decapping, aliquoting, centrifuging, intelligent refrigerated storage (up to 15,000 tubes), and disposal. All of this is driven by the CentraLink Data Management System.

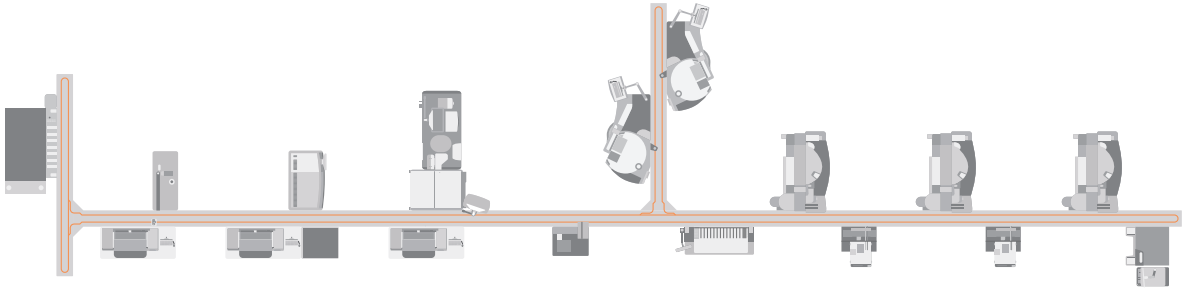
Designing automation on demand

In September 2013, preparation for building the new Aptio Automation track started at the Notre-Dame site, only four months after a purchasing decision was reached. All the track's analyzers were delivered early in 2014, so the validation process could be initiated. From February onward, Siemens Healthineers implemented the track and carried out extensive testing procedures before Aptio Automation went live in April 2014.

As the two separate labs were merged at CHwapi Notre-Dame, the laboratory remained fully up and running at all times during the installation of the track. "This was far from obvious," Dr. Marchal commented. "But Siemens Healthineers aptly deployed the ADVIA® systems for hematology, the IMMULITE® and ADVIA Centaur® systems for immunology, and the Sysmex® system for coagulation testing. Add to that a full range of pre- and post-analytical sample-processing modules, and you'll agree that we ended up with a comprehensive track to support our lab from A to Z."

To fully tailor Aptio Automation to the staff's needs, Siemens Healthineers worked closely with the CHwapi laboratory. "For starters, a team from Siemens Healthineers observed our activities for a whole day, scrutinizing each step in our processes, to understand our every goal," Dr. Marchal explained. "The number of analyzers, the layout for the track's sample-processing modules, the availability of an 'urgency input tray': everything was thoroughly accounted for in detailed simulations of the track and its respective installations. That way, Siemens Healthineers clearly indicated how we would be able to handle the combined activities of our labs."

"To name just one specific example, Siemens Healthineers made sure to foresee an open slot to add an extra Dimension Vista® installation," Dr. Marchal recalled. "The engineers predicted that two of these intelligent lab systems would only be just enough to handle all assay procedures during monthly dialysis peaks. The fact that we could easily add a third Dimension Vista system, for reasons of convenience, is a telling indicator of Siemens Healthineers flexibility and capacity to plan ahead in the utmost detail."



At CHwapi, the 25-meter Aptio Automation track includes:

- Input/Output Module (1) and Bulk Input Module (1)
- Refrigerated Storage Module (1), Sealer, Desealer, and Decapper units (1 of each)
- Aliquoting (1) and Centrifuging (2) Modules
- Dimension Vista 1500 Intelligent Lab System (3)
- ADVIA 2120i Hematology System (3)*
- IMMULITE 2000 XPi Immunoassay System (1)
- ADVIA Centaur XP Immunoassay System (2)
- Sysmex CS-5100 System for coagulation analysis (1)
- DiaSorin LIAISON XL chemiluminescence analyzer (1)
- CentraLink Data Management System (1)

**One of the three ADVIA 2120i instruments was added to the track in September 2015.*

"Siemens CentraLink Data Management System enables us to follow up on every tube individually in every single processing phase. What's more, without the autovalidation possibilities CentraLink has to offer, I am sure that our work would simply be unmanageable."

Mr. Jean-Jacques Parez | Biologist at CHwapi

CentraLink system: a familiar face in the midst of change

Aptio Automation has the CentraLink Data Management System as its middleware. "About half our staff was already familiar with this software, since we used to work with it at the Notre-Dame site," Mr. Parez explained. "That way, we didn't have to train as many people, which significantly smoothened the change process. Furthermore, using CentraLink allowed us to retain no less than 90% of our configuration and programming efforts from the past."

But the CentraLink system also created many other possibilities. For instance, the CentraLink system is linked to CHwapi's LIS patient records system. This allows the middleware to use information from the LIS, the track, and its instruments to automate workflows across automation, analyzers, and IT.

Smooth processing and intelligent routing

The CentraLink system can pinpoint every test tube's location at any time, whether it's somewhere on the track or in refrigerated storage. As a result, laboratory staff must no longer search manually for tubes. Moreover, the system also streamlines the CHwapi laboratory's pre- and post-analytical sample-processing tasks.

"Thanks to the Bulk Input Module, for instance, we no longer need to arrange the tubes beforehand," Dr. Marchal explained. "As long as the tubes are labeled correctly, CentraLink sends them to the appropriate analyzer. In addition, it also makes sure that the track decaps the tubes and centrifuges them accordingly." "The track optimizes all major post-analytical tasks as well," Dr. Marchal continued. "For example, after requesting an add-on test in the LIS, a specific blood sample will be automatically taken from the cooled storage, desealed, and/or distributed in aliquots for additional or specialist analysis. What is more, the intelligent Refrigerated Storage Module automatically stores the appropriate tubes for 7 days, reintroduces them onto the track if necessary, and eventually disposes of them automatically during the night. All of this saves us a tremendous amount of time."

Automated validation

Thanks to the CentraLink system, the CHwapi laboratory reaps the benefits of autoverification. "Only 25% of our workload still requires manual technical validation," Mr. Parez commented." It goes without saying that this advanced type of autovalidation dramatically improves our turnaround time. The technical validation is consolidated in the middleware, while the biological validation is still carried out in the LIS. But it's very reassuring to know that CentraLink can serve as a backup in case of an unexpected shutdown, for instance."

Talent management

"It might be less obvious at first sight, but the CentraLink system also helps us optimize our human resources approach," Dr. Marchal added. "Since the software enables us to automate countless routine tasks, we can redirect the knowledge and skills from our laboratory staff to responsibilities with more added value, benefiting both the lab and the hospital center."

Flexible, scalable, and futureproof

In designing the track, the CHwapi laboratory preferred to keep all its options open. And you can take that quite literally. Within the current track area, Siemens Healthineers made sure to provide several open slots for other subsequent installations, including an erythrocyte sedimentation rate analyzer and an HbA1c analyzer.

"Such flexibility and scalability will definitely prove its worth," said Dr. Marchal. "After all, we are thinking of adding several analyzers to the track in the future. What is more, we are already counting down the days till the launch of Siemens Healthineers new range of hematology and immunology systems, which will allow us to bring our turnaround time to an even lower level."

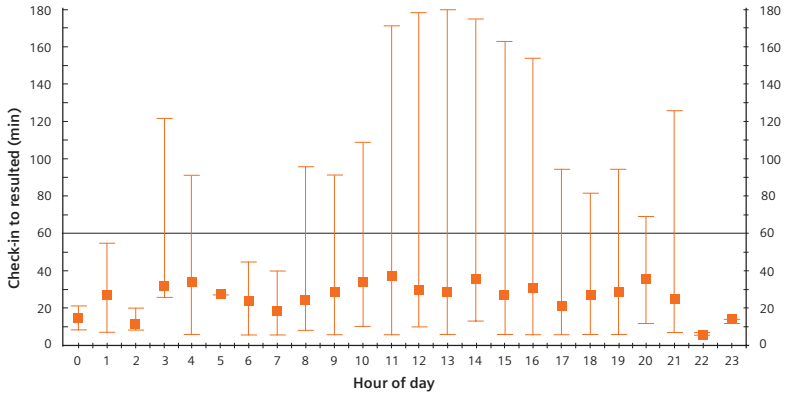
"In designing a scalable track, Siemens Healthineers also ensured open connectivity," Dr. Marchal continued. "That way, in close partnership with our regular Siemens Healthineers teams, we could still easily integrate analytical instruments that do not bear the Siemens signature, an important, cost-reducing asset. This is especially true since we will be installing a non-Siemens Healthineers electrophoresis analyzer at some time in the future."

In three to four years, the CHwapi laboratory will probably move to a new, yet-to-be-constructed hospital building. "At that point in time, we will have to move our entire Aptio Automation track as well," Dr. Marchal observed. "We are confident that Siemens Healthineers will once again live up to its commitment of flexibility to fine-tune and expand the current track and thus further improve our efficiency and productivity."

Production of new tubes per day (excluding sort and aliquot tubes)

Instrument	Total Tubes	Peak Hour Tubes
Sysmex CS-5100	284	38
Dimension Vista 1	507	105
Dimension Vista 2	404	68
Dimension Vista 3	449	96
ADVIA Centaur 1	190	50
ADVIA Centaur 2	196	42
IMMULITE	53	12
LIAISON XL	89	25
ADVIA 2120 1	340	41
ADVIA 2120 2	312	67

Total turnaround time for all analyzers



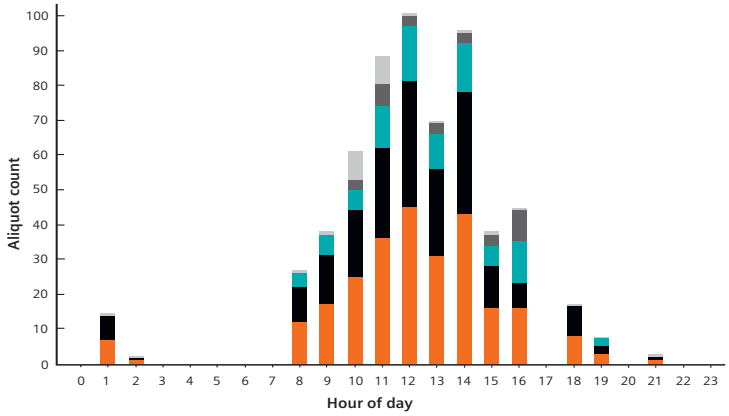
The numbers tell the story: faster and more efficient testing

The CHwapi laboratory can now process up to 3000 test tubes a day on the Aptio Automation track and carry out more than 10 times as many tests. Operating day and night, the track can process over 95% of all the analysis requests it receives. Meanwhile, the laboratory's mean turnaround time improved dramatically. It is now well below 60 minutes, and even less for urgent demands.

When it comes to pre- and post-analytical tube processing, the CHwapi laboratory reaps the time-saving benefits of total lab automation. With a capacity of up to 15,000 samples, the smart Refrigerated Storage Module stores hundreds of tubes every day and disposes of at least as many every night. On average, the Aptio Automation track also produces over 250 aliquots per day. To put this into perspective, the CHwapi laboratory previously performed this daunting task manually.

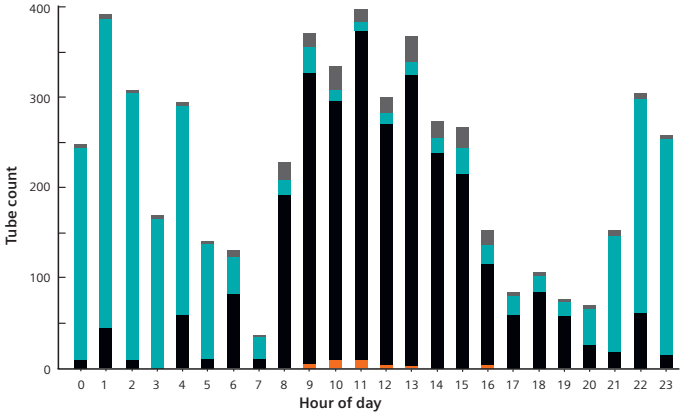
The 25-meter track includes various modules that not only eliminate manual tube processing, but also make it easier to rerun or add tests. "That way, we can upscale our staff's responsibilities," Dr. Marchal concluded. "Currently, for instance, we only need five instead of eight technologists to manage the daily hustle and bustle of the track's immunology and biochemistry testing. As a result, more people are available to watch over the quality of our laboratory's services."

Number of automatically processed aliquots (AQM)



Primary tube	Aliquot tube 2	Aliquot tube 4
Aliquot tube 1	Aliquot tube 3	

Refrigerated Storage Module (RSM)



Loaded onto the track from the RSM	Disposed (in waste bin)
Unloaded from the track into the RSM	Reloaded onto the track from the RSM

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.

The outcomes obtained by the Siemens Healthineers customer described here were realized in the customer's unique setting. Since there is no typical laboratory, and many variables exist, there can be no guarantee that others will achieve the same results.

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