

# Improved IHC Workflow Reduced Average Monthly Overtime



## Background

The Pathology Department at the University of Tsukuba Hospital was operating four immunostaining instruments at full capacity to manage the growing workload of immunohistochemistry (IHC) slides. However, there was a limit to the number of slides they could stain per day, and the increasing number of IHC cases also meant more overtime for the lab personnel.

In search of solutions, they decided to increase their capacity, but they were also looking for ways to get more accurate results and faster diagnoses. Agilent Dako Omnis was chosen for its accurate and fast results, but even more for its ability to improve the IHC workflow.

Read their story here.

## Analyzing the cause of their current situation

The IHC laboratory at the hospital was in a critical situation, receiving more tissue specimens than they could handle both from its own institution as well as from other hospitals. The analysis showed that the number of specimens and IHC cases were continuing an upward trajectory growing 27% over the last two years. The daily volume of slides had significantly impacted staff overtime despite their efforts to maintain stains at the most necessary level with specific sets of antibodies for each disease. It was time for a change, and for the lab to uphold its long-standing tradition of adaptability and innovation.

Their detailed analysis revealed several challenges:

- 1 The laboratory's processing capacity was struggling to keep pace with the escalating testing volumes.
- 2 The duration from request to processing was becoming a bottleneck.
- 3 Overtime was trending upwards.
- 4 The process of affixing labels was time-consuming and associated with risk of error.



University of Tsukuba Hospital

5,500 IHC cases per year

> 150 antibody menu

One IHC technician in IHC lab per day.

Opening hours: 8.30 a.m. – 5.00 p.m.  
(Monday to Friday)

## Incorporating a Dako Omnis in the laboratory

In October 2021, the laboratory made a strategic move to enhance its IHC workflow by incorporating a Dako Omnis, which with its advanced features became a game-changer. It offers automated staining processes, including deparaffinization, and can operate independently overnight. It also allows continuous processing of cases in units of five slides per rack. The connection to the hospital's Laboratory Information System (LIS) enables order information to be printed on the slide label and facilitates sharing of requests with the two Autostainer Link 48 instruments that the laboratory already had.

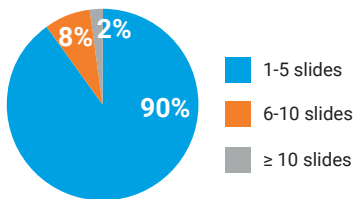
### 1 Addressing challenge number 1: Capacity

The introduction of Dako Omnis effectively addressed several challenges including the challenge of keeping up with the increase in testing volumes. By prioritizing staining on Dako Omnis, the laboratory was able to expand its daily processing and an analysis of the average slides per patient case showed that most cases could fit into one rack—as per Dako Omnis design (Figure 1).

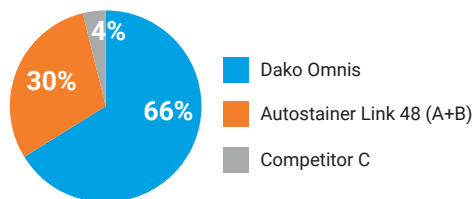
The single Dako Omnis instrument quickly became the 'workhorse' instrument that was processing more cases than the other three stainers combined. The impressive throughput of Dako Omnis with up to 105 slides in an 8-hour workday with an additional 60 slides during overnight staining is the basis for its ability to absorb the main workload in the lab.



Slides per Case



Distribution Between Instruments



**Figure 1. Slides per case** for 187 cases, 544 slides. Of the 187 cases, 168 cases (90%) can be stained in the same one rack provided that the protocols share the same pretreatment protocol.

**Distribution between instruments:** the data is based on analysis of the slides for 149 cases that were assigned to a single instrument. A similar distribution pattern was seen for cases with slides split over multiple instruments. For these cases, Dako Omnis was also processing most slides.

### 2 Addressing challenge number 2: Time from request to processing

The capacity and throughput of Dako Omnis is not the only reason for the success seen in the Pathology Department at the University of Tsukuba Hospital. The lab also recognized that with modifications to their IHC workflow they could maximize the potential of the Dako Omnis instrument. They implemented a first-in, first-out patient case process using the continuous loading and unloading capabilities of Dako Omnis. They also made clever use of the built-in overnight staining feature, which effectively reduced the following day's staining workload.

#### Dako Omnis Design

The theory behind the Dako Omnis design is to accommodate that most IHC-based cancer diagnoses are done with five or fewer antibodies. Therefore, the Dako Omnis slide rack system has five slides per rack and slide racks can be loaded continuously. When a patient case requires more than five different tests, the second or third rack can be loaded back-to-back, and all slides for the patient case will finish almost at the same time. The high capacity with 60 different temperature-controlled reagent positions enables many test panels to be ready onboard the same instrument so entire patient cases can be tested quickly without having to shuffle antibodies or split cases between instruments.

In the 'Before' workflow (Figure 2), the IHC technician would only pick up orders that were submitted on the previous day or early morning before 8:30 a.m. and process all slides during the day. While the standard processing time was a respectable 10.5 hours, the actual turnaround time (TAT) from request to delivery could be up to 34 hours, e.g., a request at 9:00 a.m. wouldn't be picked up before the following morning at 8:30 a.m. and delivered back to the pathologist between 5:00 to 7:00 p.m..

### Before Dako Omnis: Single pick-up workflow

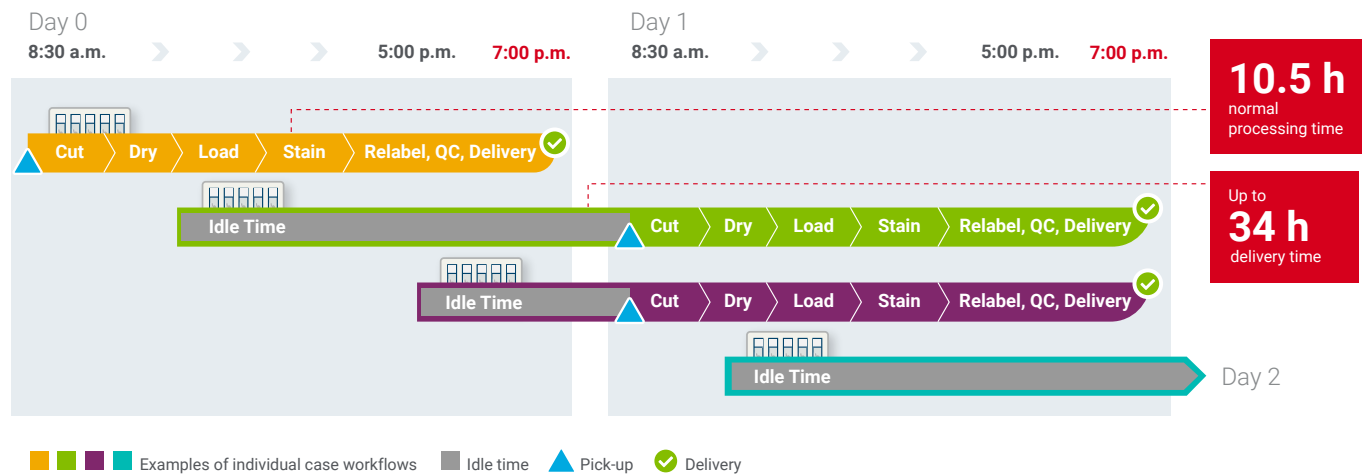


Figure 2. In the 'Before' workflow, only orders from the previous day or early morning would be picked up at 8:30 a.m. and processed in a linear, batch-driven workflow.

### After Dako Omnis: Continuous pick-up workflow

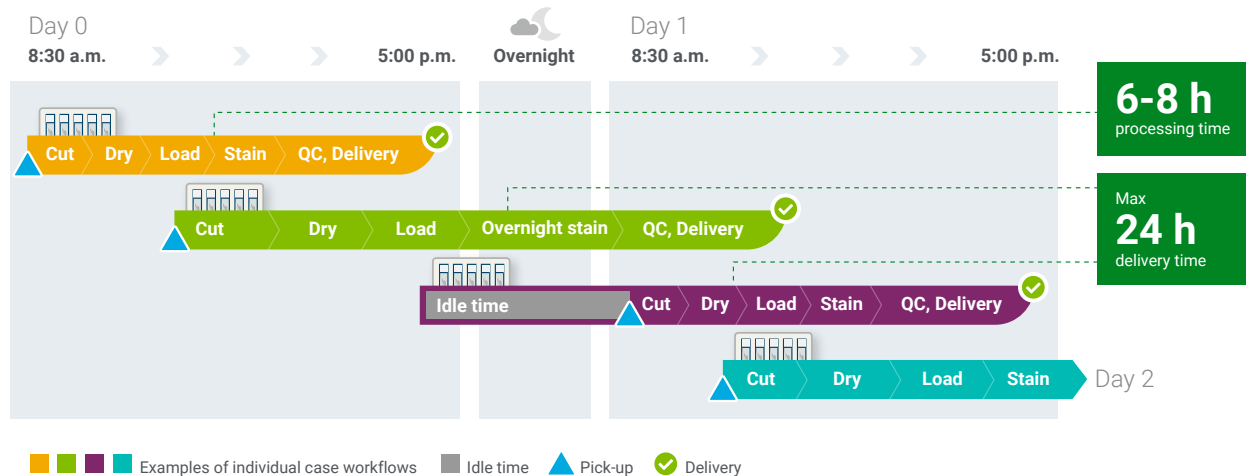


Figure 3. With multiple pick-up times for requests during the day coupled with easy loading of cases, less splitting on instruments, and no relabeling of slides, the lab was able to cut down the processing time to 6–8 hours and deliver completed cases throughout the day. The overnight staining of requests that were picked up during the day ensured that the delivery time, i.e., the actual TAT of patient cases, didn't exceed 24 hours.

In contrast, in the 'After' workflow (Figure 3), requests received after 8:30 a.m. were no longer deferred until the next day. Instead, they were promptly picked up, dried, and prepared for staining immediately or overnight on a first-in, first-out basis. Coupled with continuous loading, unloading, and delivery of complete patient cases throughout the day, they managed to reduce the standard processing time from 10.5 hours to 6-8 hours (a 24% to 43% reduction). Consequently, no patient case had to wait 34 hours for IHC staining results to be delivered back to the pathologist.

### 3 Addressing challenge number 3: Overtime

Before the introduction of Dako Omnis, IHC requests were a constant race against the clock for the pathologists. The lab technician would collect the IHC staining order form once each morning. If the pathologists missed the morning pick-up, they would have to wait until the next night for staining results.

However, with the installation of Dako Omnis, this process has been significantly improved. Requests are now processed multiple times per day, and staining results are likewise delivered to pathologists several times daily. The new workflow has drastically reduced the idle time from request to staining, allowing for immediate loading of cases after drying. Consequently, the time to completion has been reduced, strongly impacting the 5:00 p.m. to 7:00 p.m. overtime hours. Remarkably, despite a 27% increase in workload, the lab achieved a 19% reduction in average monthly overtime (Figure 4).

*"We are now able to receive staining results multiple times during the day and perform patient case assessments accordingly. This is extremely efficient".*

– Professor Dr. Matsubara,  
Pathologist

Overtime Reduction

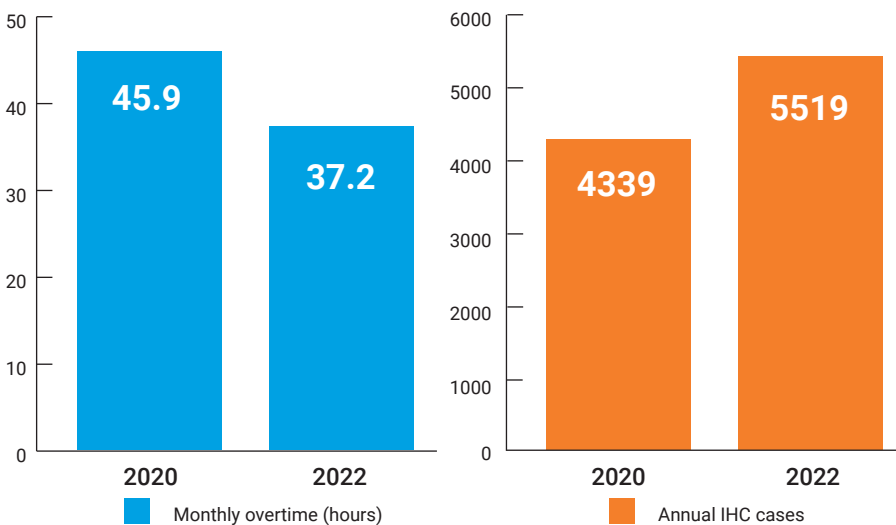


Figure 4. The annual workload grew 27% over two years, but the lab was able to reduce overtime by 19%.

## 4 Addressing challenge number 4: Labels

The introduction of DakoLink software to track requests and patient IDs on labels by connection with the LIS made a positive change to how slide labels were handled in the lab. Previously, the lab had a two-step label process, first affixing a barcode dedicated to the staining instrument at the time of staining, then affixing another label bearing the pathology number, ID, and patient name upon delivery. This was partly because the barcodes on the slides were not compatible with the staining instrument.

These operations were not only time consuming but also posed a risk of labeling errors, potentially leading to patient mix-ups. The implementation of DakoLink streamlined this process. By connecting with the LIS, it allowed for a single label to be used throughout all operations. This not only saved time but also effectively minimized potential labeling errors (Figure 5).



**Figure 5.** DakoLink and integration with LIS resulted in less labeling time and minimized risk of labeling errors.

### Conclusions

Introducing one single Dako Omnis, and implementing a case management workflow, enabled the lab to work much faster (43% reduction in processing time), get more cases done (27% more workload), in shorter time (19% reduced overtime). This was achieved without compromising the quality of stains, even as IHC volumes continued to rise.

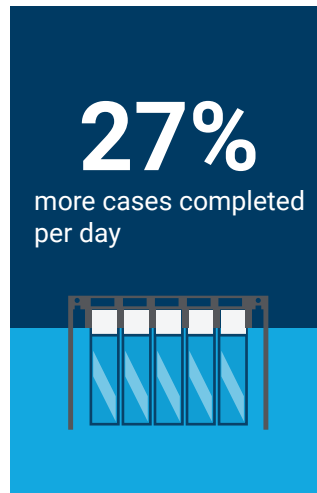
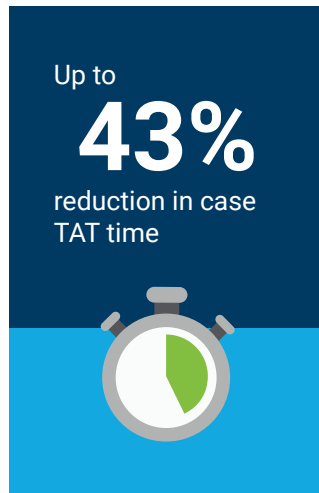
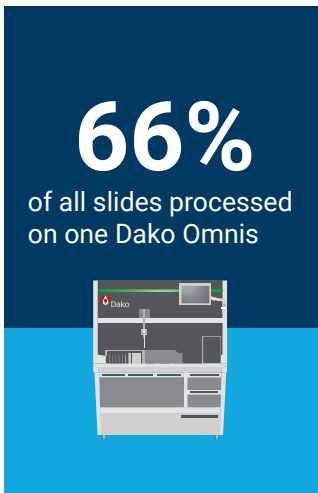
The previous workflow forced pathologists to rush their orders with a missed deadline resulting in long waiting time for patient case results. After implementation of a case management workflow with Dako Omnis, these order forms are now collected multiple times per day, and the staining results are delivered back to the pathologists multiple times per day resulting in reduced processing time from 10.5 hours to just 6-8 hours.

*“For a more efficient IHC workflow, we are considering adding another Dako Omnis for a total of two units in the future. We will continue our coordination between pathologists and laboratory technicians to achieve more accurate, speedy diagnoses”.*

– **Mr. Murata,**  
Chief Technician

*“Dako Omnis has boosted our efficiency and helped us deliver more accurate diagnoses”.*

– **Mr. Murata,**  
Chief Technician



[www.agilent.com](http://www.agilent.com)

D0114391\_1.00

This information is subject to change without notice.  
This product is not for purchase by the general public.

© Agilent Technologies, Inc. 2024  
Published in the USA, May 01, 2024  
29620 2024FEB06