



## WHY DO REFINERIES NEED AI-DRIVEN ANALYSIS? OR, GET YOUR ANALYZER TO WORK FOR YOU

### Why should process control be automated

As a process engineer, you know that many types of analyzers have not brought full automation into your process control. Oftentimes the costly, human-intensive effort of model calibration, may cause a compromise on the quality of the analysis. Despite heavy investments in new technologies, poorly maintained analyzers result in inaccurate measurements.

"Why is this process not automated?" that is one of the first questions that Dror Albo, the Software Lead Engineer at 4IR Solutions, Ltd. asked when he first visited a refinery in North America. During this visit he was introduced to the time-consuming manual process of chemometric model maintenance. At the time, the most common answer was "That's how we're used to doing things." or "We've always done it that way."

This approach led the refinery to suffer from:

- Slow response to changes in feedstock or processing conditions
- High dependency on qualified personnel for data collection and analysis
- Lack of integrated model validation of the analysis quality

Despite the efforts (and cost) put into data collection and analysis, process engineers were not getting the results they needed to optimize production. The analysis proved complex due to:

- A manual process, repeated separately for each property
- A compromise on a low number of properties measured
- Poor model maintenance

In short, operators at the refinery were working for their analyzers.

Coming from the world of software development, it was clear to Dror that there is another way. By focusing on AI-driven methods, measurement and analysis could indeed be automated. This meant the analyzer would be working for the operator, and not vice versa.

This realization led to the development of the iModel/Model Gateway software, and it was introduced to the market in 2016.

### The importance of automated modeling

Modeling is mandatory for any spectral analyzer, as there is no straightforward way to define the relationship between the spectrum and the corresponding direct value (e.g., octane number). Offline modeling tools are in use in this industry, but the frequency of measurement is low (one sample a day is analyzed in the lab). iModel/Model Gateway, powered by AI technologies, automates this task.

Automated modeling enables the analysis of larger quantities of data. This means input can be increased while the quality of the analysis is maintained or even improved. The quantity and complexity of the calculations that the software can perform considerably exceeds manual methods. In short, there is no way to perform the analysis manually with the increased frequency of input.

"In order to achieve efficient automated modeling, two main concerns guided the iModel/Model Gateway development team", Dror said. Runtime and analyzer support.

The first was developing an AI algorithm that accomplished the analysis within a reasonable time frame, using small training

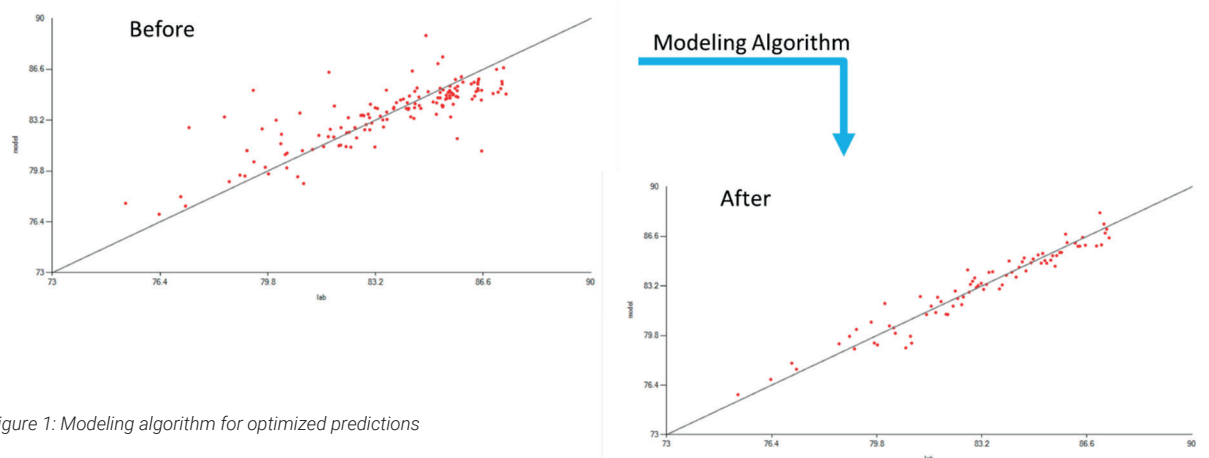


Figure 1: Modeling algorithm for optimized predictions

sets. Another important consideration was to make the software analyzer agnostic. The idea was to support any type of analyzer available in the market such as: ABB, Bruker, ThermoFisher, Guidedwave, Metrohm and others.

### A one stop shop for efficient process analysis

The software platform leads to new process architecture with three interfaces: Analyzer, lab and DCS.

A sample is still taken once a day to the lab and the operator loads this data into the software. But now the spectra from the analyzer is loaded into the platform automatically and with a higher frequency. The chemometric models are built automatically by the AI algorithm. Linear modeling uses known spectra and lab data in order to build a model that can predict unknown spectra. Each new spectrum is processed, predicted and reported to the DCS. Just feed the system with lab data, the rest is automatic!

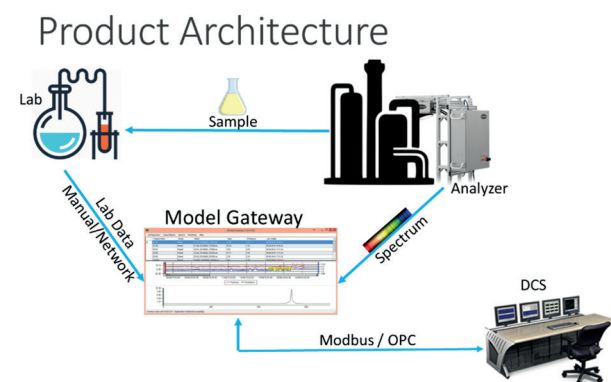


Figure 2: Multiple interface communication  
[https://www.youtube.com/watch?v=eqYa\\_I3IEH4](https://www.youtube.com/watch?v=eqYa_I3IEH4)

### Automated process control enables fast response to changes

iModel/Model Gateway is:

- Compatible with any analyzer (NIR / NMR / FT-IR) and any LIMS database
- It supports any DCS, Modbus or OPC connection
- The software-only platform offers a small footprint
- It can analyze an unlimited number of predicted properties
- No user intervention is required as modeling is fully automated

Process engineers enjoy a complete infrastructure solution: Modeling-> prediction-> communication-> reporting.

"Process control results in real-time, enable process engineers to cope proactively and quickly with changes in temperature and feeds, adjusting the manufacturing process with a higher frequency." says Dror. This means that automation is key to ensuring enhanced efficiencies and cost reduction, and to keeping up with a changing environment

After dozens of installations worldwide, the iModel/ModelGateway Software has proven that high-quality models can be created without human intervention. AI-driven automation simplifies the analysis process, allowing a large number of predicted properties, and leading to enhanced optimization of production yield and cost.

Looking back, the visit to the refinery in North America proved to be a turning point in Dror's career. "To me it was a no-brainer", he says. "It was obvious that automation was called for to optimize data collection, model creation and the analysis process". iModel/ModelGateway has since proven many times that with AI solutions, you can indeed get your analyzer to work for you.

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