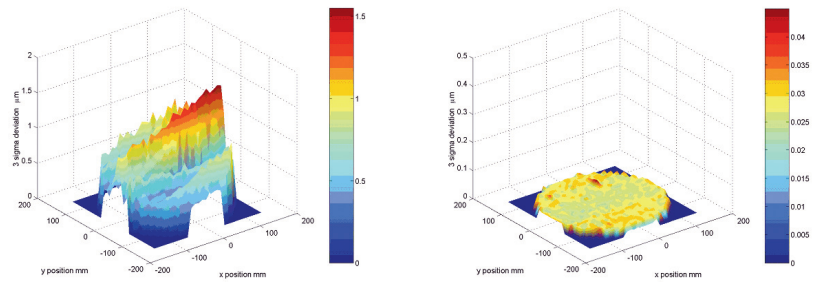


Newport Corporation Reduces Data Acquisition and Analysis Time by Hundreds of Hours



Comparing positional deviations using MATLAB after one hour of testing (left) and after eight hours at steady state (right).

Newport Corporation (Newport) develops a variety of products for the semiconductor research industry, including motion control devices that move silicon wafers with the precision required during the microchip fabrication process. As the semiconductor industry continues to miniaturize electronics, Newport's products offer resolutions at the nanometer level and smaller. At such a small scale, a tenth of a degree drop or rise in temperature can affect movement and the success of microchip fabrication.

Measuring these changes requires precise instrumentation, including thermal sensors, laser interferometers, autocollimators, and accelerometers. It also requires quick and accurate analysis of test data. Newport acquires and analyzes measurement results from these instruments quickly and easily using MATLAB® and related toolboxes.

“Because we use the Instrument Control and Data Acquisition toolboxes, all the test data is in MATLAB, and I can obtain the results immediately,” says Reed Farrar, a manager in the System Test and Quality Assurance Department at Newport. “We used to spend days on just one test. With MATLAB, we can run the same test and analyze the results in a few hours.”

THE CHALLENGE

Newport set out to customize one of their motion control products to enable a semiconductor customer to determine positional accuracy.

The project would involve a wide range of tests to measure temperature, pressure, humidity, and movement within precise tolerances. “The challenge lies in controlling the instruments, and acquiring and analyzing the data,” states Farrar. “We may use ten to twelve thermal sensors on a product and laser interferometers to measure motion.”

Building and maintaining test cases to control multiple instruments in a generic programming language like C would be time consuming. Transferring measurement results from instruments into a data analysis tool after each test would also pose a challenge. Moreover, the volume of data to be transferred could not be accomplished using a spreadsheet because of the high number of instruments, measurements per test, and frequency of test runs needed. Otherwise, Newport would need to repeat the same test multiple times, and the data correlation would not be accurate.

To control multiple instruments and acquire and analyze measurement results without writing C code, Newport would require test and measure-

THE CHALLENGE

To control, acquire, and analyze test data more quickly, efficiently, and accurately

THE SOLUTION

Use the Instrument Control Toolbox to control instruments, the Data Acquisition Toolbox to acquire data, and MATLAB to perform data analysis

THE RESULTS

- Customized product delivered on time
- Reliable measurement results acquired from multiple instruments
- Hours of data analysis time saved

ment software with support for off-the-shelf test and measurement hardware and proven data analysis, visualization, and plotting capabilities. Finally, this project would need to be completed within tight time constraints.

THE SOLUTION

Newport increased the efficiency and quality of their test data by using MATLAB, the Instrument Control Toolbox, and the Data Acquisition Toolbox to acquire and analyze measurement results from within a single environment.

“We tinkered with gathering and manually integrating data from numerous instruments, but the time and costs were prohibitive,” says Farrar. “For example, data from an eight-hour test run previously took us a week to analyze. Using MATLAB with the Data Acquisition Toolbox and the Instrument Control Toolbox, this time was reduced to 10 minutes.”

They used the Instrument Control Toolbox to connect and control test instruments that measure temperature, pressure, humidity, and motion without using separate products.

Using the Data Acquisition Toolbox, Newport gathered hours of test data by interfacing directly with data acquisition boards from several commercial vendors, including Measurement Computing.

“By collecting all our measurements directly into MATLAB, we collected all our measurements in a single test run, saving time and making data correlation more accurate,” says Farrar.

Newport used MATLAB to scan the axes of motion to characterize positional accuracy and repeatability. They generated a three-dimensional plot with colors representing deviations between measured and calculated positions. MATLAB helped Newport visualize the data



We move up our deadlines because analyzing our data now takes only minutes. MathWorks tools have saved us hundreds of hours in testing time.



Reed Farrar, Newport Corporation

to confirm accuracy and repeatability as well as to isolate problem areas. Newport provided the MATLAB plot to their customer and proved that their product met technical specifications.

Newport continues to use MathWorks tools to instrument and automate their operations, which include experimental tests and manufacturing.

THE RESULTS

■ **Customized product delivered on time.** “Releasing our products on time depends on how quickly we can obtain our tests results,” Farrar explains. “Using MATLAB with the Instrument Control Toolbox and the Data Acquisition Toolbox helped us to meet our project’s deadline and make our project successful.”

■ **Reliable measurement results acquired from multiple instruments.** “Before MATLAB, we had to measure one axis at a time, which led to time lapse problems,” states Farrar. “Now, we can gather data from many instruments, perform analysis, and be extremely confident in our results.”

■ **Hours of data analysis time saved.** “We could write our analysis code by hand, but MATLAB already has the functions built into it,” says Farrar. “That saves us hours of time.”

To learn more about Newport Corporation, visit www.newport.com

APPLICATION AREAS

- Data analysis
- Semiconductor
- Test and measurement

PRODUCTS USED

- MATLAB
- Instrument Control Toolbox
- Data Acquisition Toolbox

www.mathworks.com