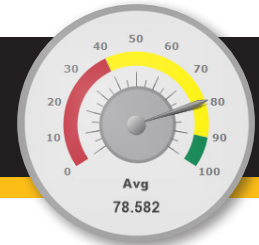


MANUFACTURING 4.0 DATA MANAGEMENT



QualityWorX is a manufacturing analytics suite that automates the collection, storage, archiving, retrieval, analysis and reporting of test and assembly data for discrete manufacturing. It delivers unparalleled insight into critical manufacturing processes, providing the competitive edge demanded by today's manufacturers. From the plant floor, to the engineering labs, to management offices around the globe, QualityWorX delivers the visibility manufacturers need to meet their production goals of improving both quality and yield while reducing costs.

FEATURES & BENEFITS

Quickly and easily gain insight into your production processes

- Construct personalized dashboards to monitor key indicators of manufacturing quality and performance
- Generate detailed reports in seconds instead of hours
- Manage your production line proactively, instead of reactively
- Accurately monitor production line performance, driving continuous process improvement
- Maximize yields by quickly identifying the cause of bottlenecks in manufacturing processes

Optimize test stations more quickly

- Faster, more accurate limit setting
- Quick root cause on issues at the station level to reduce downtime
- Faster setup and runoff using data

Develop a deeper understanding of manufacturing processes through analysis of stored process signatures

- Quickly compare signatures from 1000's of parts to identify features that can be correlated to product quality

- Re-analyze stored signatures to quickly optimize spec limits and test parameters
- Identify new failure mechanisms and develop new feature checks based on re-analysis of historical waveforms
- Accelerate process development, new product introduction, and line launch
- Analyze waveforms, review trends, and correlate across stations to quickly identify root causes of defects without the need for expensive and time-consuming destructive tests

Maintain 100% traceability through detailed records of end-to-end manufacturing data

- Collect and store the complete test record for every part – including process signatures—from a broad range of manufacturing hardware, including tools, testers and PLCs
- Provide proof of compliance and retain detailed birth history records for regulatory requirements

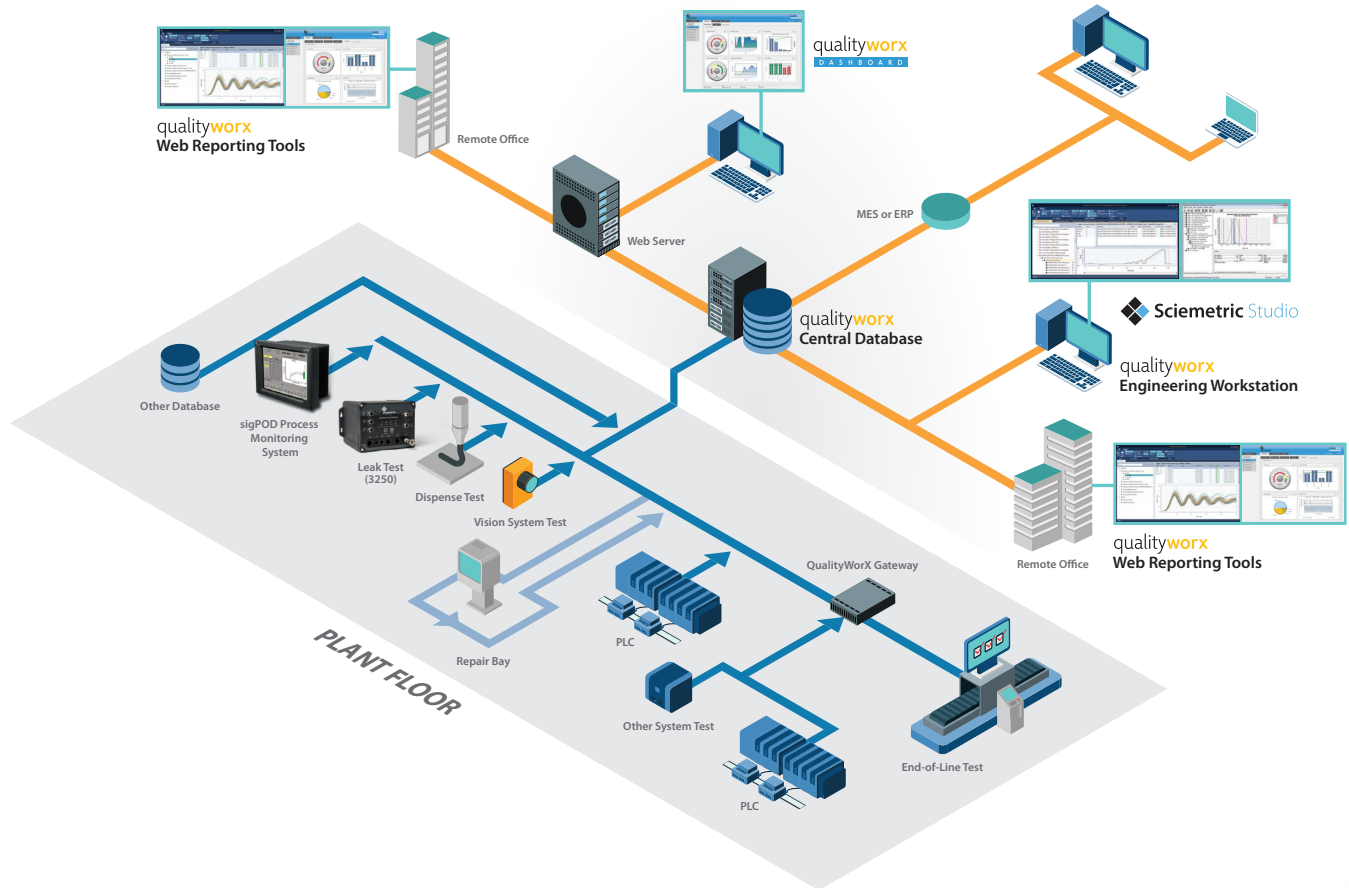
Minimize the impact of quality spills and reduce warranty costs

- Quickly identify other affected parts without the need for tearing down or re-testing parts – based solely on re-analysis of stored signatures
- Confine recalls to only the defective parts

Uniquely able to analyze digital process signatures

- Better data visualization of manufacturing processes
- Maximizes value from data for root cause, continuous improvement or other initiatives
- Full reporting with drilldowns on signatures

FUNCTIONAL OVERVIEW



QualityWorX is a suite of software tools that automates the collection, storage, analysis, and reporting of manufacturing data. It combines the flexibility and speed of a SQL database, the power of advanced analytics, and the ease and accessibility of web-based reporting. All types of production data, including assembly, test, and repair operations, are collected from a wide range of plant floor systems for storage within the QualityWorX database. Reporting and analysis tools access the database across local and wide area networks, providing critical insight into the manufacturing processes and production line performance to all levels within the manufacturing organization.

COMPONENTS OF QUALITYWORX

The QualityWorX data management and reporting system is comprised of a database and its associated tools; data connectors and gateways to feed the data into or push data from the database; and manufacturing analytics.

DATABASE

At the core of every QualityWorX installation is a SQL database built on Microsoft SQL Server technology. It is optimized to efficiently handle the data to meet the pace of the production line. The database is architected to efficiently store and organize all of your production data, including process signatures, features, spec limits, part-specific parameters, images, and defect and repair data.

The database is designed to grow with your testing and manufacturing data collection needs. During production, new models and parts can be configured on the fly and test or other stations added or deactivated without any production downtime.

Database Management Tools

Included with every database license, these tools are typically used by the database administrators to configure the production lines within the database and manage the archiving of data from active databases.

Configuration Tool

The Config Tool is a utility that allows the system admin to configure production lines in the database, which includes defining all the part types, sections and stations as well as the relative order of the stations on the line. It provides the capability to update system options, manage user accounts and parts, and define a defect and repair coding specific to your manufacturing process.

Enterprise Management Services

Enterprise Management Services is a centralized security system that manages all QWX databases using Active Directory Federated Services (ADFS). It provides an Audit Log to monitor and record any user activity, security changes, management events, and configuration changes to whichever tool you are using to connect to Enterprise Management Services.

Archive Manager

Archiving is critical to maintain database performance and the Archive Manager enables storing of data into secure archives without any interruption in production. It ensures speedy access to the latest production data while still allowing for full analysis of current and archived data.

The Archive Manager is used to manage the data stored within the database, by allowing the database administrator to copy, move or delete records. Archive jobs can be created, saved and executed from its interface or can be scheduled to run at regular intervals using the Windows Scheduler utility.

DATA CONNECTIONS

Each source feeding data into the database requires a software-based data connector or gateway. Sciometric offers connectors for a range of manufacturing tool and software providers for systems including:

- Popular PLCs
- Test systems from Sciometric or other vendors
- Leading brands of rundown tools
- Other tools such as welders
- Vision systems
- End-of-line tests such as hot test, leak test, cold test
- Data acquisition products

The connectors enable the collection of full process signatures, scalar data, images and more.

Also available are gateways to insert data into other databases such as Manufacturing Execution Systems (MES) or Enterprise Resource Planning (ERP) systems. The number of connectors is continuously growing; contact Sciometric for information or to learn more about having your plant floor tool be QualityWorX-enabled.

DATA FORMATS AND SOURCES (CONNECTORS & GATEWAYS)

Connectors

Rundown Tools	Atlas Copco, Bosch, FEC, Estic, Cleco, Desoutter, Stanley, Ingersol Rand, Sanyo, DDK
Vision Systems	Cognex, Coherix, Indicon, Intelligent Sensing, Keyence
Presses	Promess, Desoutter, TOX, Coretec
Functional Test / End-of-line Systems	Sciometric, Cincinnati Test Systems, Marposs, National Instruments, Kistler, ABB, AVL, thyssenkrupp (UPS64 and PMS), Gardner, Instron, JW Froehlich, Lanbi, FEV Morphee, W-lbeda, custom engine tests (Cold Test, Hot Test, ECU)
Measurement	DMIS, Zeiss, Mitutoyo, Keyence, Adcole, Alfing, ESI Finescan
Plant Systems	PLCs, Herrmann Ultraschall, Red Lion, BW-TEC, deviceWISE, OSIsoft, Factory Talk
Custom	Proprietary systems, customer-specific data formats

Data Transfer Methods

File-based	FTP, Webservice, MQTT, network share, Application Programming Interface (API)
Industrial protocols	OPC, OPC UA, Modbus TCP, PROFINET, Serial

Data Import Formats

Machine and human readable data files (JSON, XML, CSV, TXT, PDF, Excel, etc.)
 A Standard Sciometric or customer-defined data formats in XML and JSON (SPH, SPHX, SPHJ, SPJ, FCDM)

Data Export Formats

ERP/MES interfaces (CSV), JSON-structured data publishers (to File or MQTT Broker), manual export of waveform and scalar results (CSV), Data Interfaces (SQL Views, Data API, REST Data API) for data reporting

REPORTING AND ANALYSIS

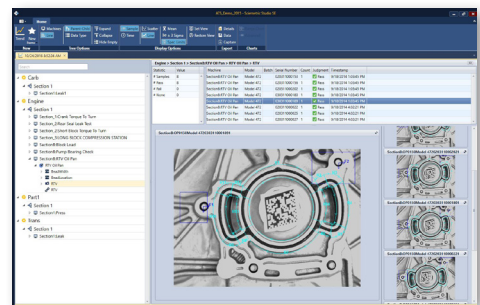
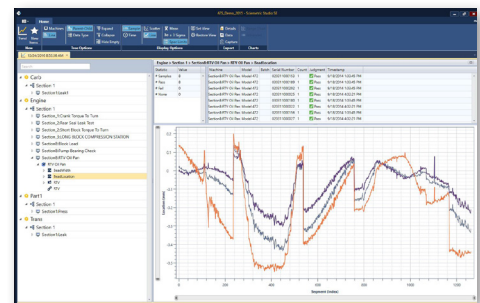
Sciometric offers three different types of analytics tools to make fast use of the data collected: **Sciometric Studio**, **QualityWorX Dashboard**, and **Engineering Workstation Analyst**.



Sciometric Studio is the next generation of manufacturing analytics from Sciometric. The growing software suite enables manufacturers to easily visualize, review, report on, compare and analyze part data to improve quality and yield on the production line. This desktop application can be used with a QualityWorX database or for local projects to analyze and review production data including digital process signatures, scalar data and images from machine vision systems.

Featuring an intuitive, contemporary ribbon-based interface, Sciometric Studio makes it easy to review data to find trends and to drill down into a full part history. With a range of features and capabilities, Sciometric Studio was designed to provide a quick path from analysis to answer.

See the *Sciometric Studio datasheet* for more information.

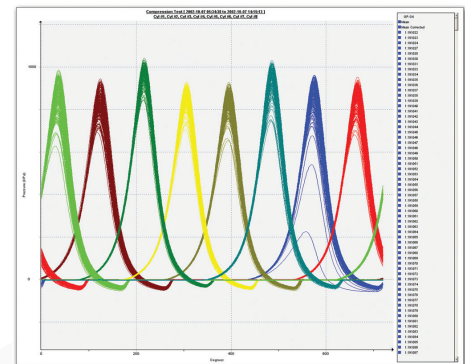


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ENGINEERING WORKSTATION

For advanced data analysis, the **Engineering Workstation** features a powerful mathematical processing engine that can simultaneously analyze thousands of waveforms, rapidly simulate a broad range of test scenarios using historical data, or identify defects using line-wide trends and correlations. These advanced capabilities are combined with a suite of standard reports to provide the ultimate in data analysis and reporting environments. Engineering Workstation is ideally suited for Manufacturing and Quality Engineers who are tasked with developing and implementing new production processes, maximizing production yields, optimizing throughput, and identifying root causes.

See the *QualityWorX Engineering Workstation datasheet* for more information.



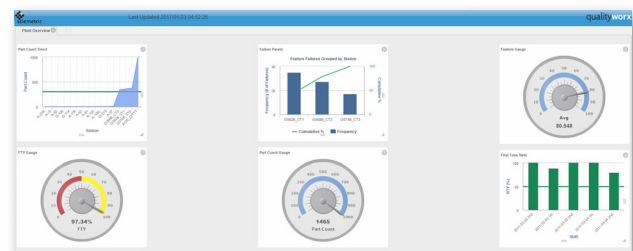
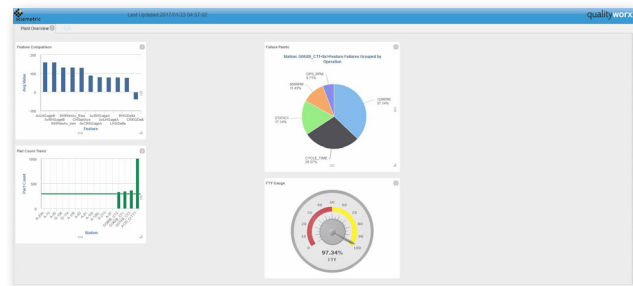
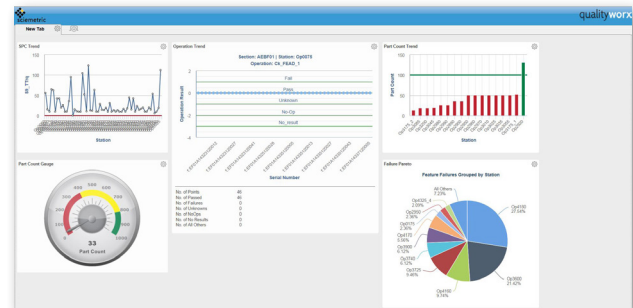
qualityworx DASHBOARD

The Web-based QualityWorX Dashboard enables you to configure concise, at-a-glance summaries of key performance indicators and create and share manufacturing reports or visual dashboards with just a few clicks. Most of the Dashboard reports allow users to click through to detailed reports on the data, drilling down from a high-level summary to in-depth detail.

Standard reports include:

- Part History report
- First time yield
- Summary report
- Trend browser
- Failure Pareto
- Failure report
- Defect Pareto
- Repair Traffic
- Analysis Grid for custom analysis

The library of dashboard panels includes a broad number of chart types to review and analyze data: Defect Pareto, Feature Gauge, Failure Pareto, First Time Yield, Part Count, Operation, SPC Trend, and Feature Comparisons.



REPAIR BAY MANAGER

Add the Repair Bay Manager (RBM) module to the QualityWorX network to provide defect and repair management. It is a flexible repair management solution that can be tailored to virtually any assembly process. The RBM application connects to a QualityWorX database to provide repair operators with a simple, intuitive interface for diagnosing failures and recording defect and repair data for long term traceability. A variety of comprehensive Defect and Repair reports deliver the real-time visibility necessary to eliminate defects and minimize repair costs.

- Guides operators through repair process with complete access to part history record
- Suggested repair function (based on defect type)
- Stores all defect and repair information in QualityWorX database as part of birth history record, including location, component, defect type and repair type
- Provides both manual and automatic interface to the production line for entry and release from repair station

TRAINING

For best practices and tips on how to use the data to find what you are looking for, Sciometric offers on-demand, instructor-led courses:

QUALITYWORX DATA ANALYSIS

Learn how to make effective use of the data collected in QualityWorX and perform in-depth analysis and generate detailed reports to identify trends, optimize tests or determine the root causes of issues affecting quality or yield. Reviews the QualityWorX analysis and reporting tools.

QUALITYWORX FOR IT ADMINISTRATORS

Course on how to maintain the users, data and health of a QualityWorX system. Includes instruction in the use of the Config Tools to maintain users, plant floor configuration and defect and repair data and how to use the QWX Archive Tool to manipulate the production database and archive databases to ensure optimum performance.

QUALITYWORX RBM OPERATOR TRAINING

The RBM Operator Course teaches participants how to view part history records, enter defect and repair data, add and remove parts from the repair bay, review part history data and recover from operational system faults.

Email inquiries@sciometric.com for course details or go to www.sciometric.com.

PRODUCT CONFIGURATIONS

DATABASE

- **QualityWorX Base**

QualityWorX Base is the starter package for small installations. The database license enables the connection of up to five sources to the database on a customer-provided server. (Please see specifications in this datasheet.) Connectors are priced separately but base includes one unidirectional connector to a Sciometric system. Web Reporter also included.

The QualityWorX Base can be expanded in 5-connection increments.

- **QualityWorX Primary**

Intended for Enterprise applications, the QualityWorX Primary database allows unlimited¹ connections on a customer-provided SQL Server. (Please see specifications.)

- **QualityWorX Secondary**

A secondary database is required for each feeder line associated with the primary assembly line (e.g., head assembly, head machining, block machining, etc.).²

REPORTING

- **Engineering Workstation Analyst**

Single or unlimited concurrent software licenses are available to connect to a QualityWorX Database and all Secondary databases on the same product line, if applicable.

- **Sciometric Studio**

Licensed by user locked to a single PC, Sciometric Studio can be used for local projects (LT) or to connect to any QualityWorX Database (SE). Single and site licenses are available.

- **QualityWorX Dashboard**

The license for Dashboard allows for unlimited client connections and an unlimited number of separate QualityWorX database connections. A single instance of the web server application is provided.

¹ Total number of connections limited by server capacity and configuration.

² One secondary database can support multiple identical lines, e.g., three head assembly lines.

TECHNICAL REQUIREMENTS

ENTERPRISE INSTALLATION

Below are the requirements for installations where more than 10 stations are reporting data into QualityWorX or if any third-party gateways are being used. Separate servers are recommended for the QualityWorX database and the applications.

DATABASE SERVER

Processor	2 GHz Intel® Xeon® E5 v3, 8 cores or better
Memory	32 GB of RAM, with 24 GB dedicated to SQL
Hard Drive	250 GB should be allocated to system drive and OS page Drive structure and available space to be based on evaluation of data storage requirements
Configuration	<ul style="list-style-type: none"> • Drive performance for OS/application equivalent to RAID10 r/w throughput • SQL log file in separate partition (solid state drive recommended)
Operating System (OS)	64-bit Windows Server family
Connectivity	1 Gbit LAN network connection between Application and Database servers
Back-up System	Adequate backup media and hardware should be provided to match Enterprise's data retention and backup policies.

APPLICATION SERVER

The Application Server is required for QualityWorX programs and tools such as Dashboard, customized data gateways, Enterprise Services, Archive Manager, SQL Tools, and database configuration applications.

Processor	2 GHz Intel® Xeon® E5 v3, 8 cores or better
Memory	32 GB of RAM
Hard Drive	500 GB, solid state drive recommended
Operating System (OS)	64-bit Windows Server family
Connectivity	1 Gbit LAN network connection between Application and Database servers

SMALL INSTALLATION

Small installation requirements for installations where 10 or fewer stations are reporting data into QualityWorX and no third-party data gateways are used. For these smaller instances, a single server can be used for both the database and application requirements.

DATABASE AND APPLICATION SERVER

Processor	2 GHz Intel® Xeon® E5 v3, 8 cores or better
Memory	48 GB of RAM, with 24 GB dedicated to SQL
Hard Drive	250 GB should be allocated to system drive and OS page Drive structure and available space to be based on evaluation of data storage requirements
Configuration	<ul style="list-style-type: none"> • Drive performance for OS/application equivalent to RAID10 r/w throughput, 500 GB for OS and applications plus drive space for data is required • SQL log file in separate partition (solid state drive recommended)
Operating System (OS)	64-bit Windows Server family
Back-up System	Adequate backup media and hardware should be provided to match company's data retention and backup policies.

SUPPORTED SOFTWARE

SQL	2016R2 (legacy support), 2019, and 2022 (coming Summer 2024)
Operating System	Windows Server 2016R2 (legacy support), 2019, and 2022 (coming Summer 2024) Windows 10 or 11 (client applications only; excludes Dashboard, Enterprise Management Services and Database (schema))

Please consult the datasheets for the individual reporting tools for additional specifications.

Talk to a Sciometric specialist about your configuration, performance and data requirements prior to purchasing the equipment to ensure it will meet your needs.

www.sciometric.com
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