Innovate

Whitepaper: Roush Yates Engines Seconds the Motion for Automated Data Acquisition

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New Data Collection Technology Ensures Speed, Accuracy, Scalability and Security.

In the auto racing world, time and accuracy are critically intertwined, driven by seconds. Not surprisingly, Roush Yates Engines (RYE) of Mooresville, NC and its manufacturing division, Roush Yates Manufacturing Solutions (RYMS), is anchored by this credo, which in turn influences how it continuously evaluates and decides the most optimal ways to leverage technology for their world class manufacturing operations. So, when RYE explored ways to improve the accuracy, integrity and throughput of its precision measurement data, the decision to deploy DataSure® 4.0, the industry's latest data acquisition solution developed by The L.S. Starrett Co. of Athol, MA, boiled down to – you guessed it – seconds.

Demanding Performance, Precision

RYE is the exclusive engine builder of Ford Performance for the top levels of NASCAR including the NASCAR Cup and Xfinity Series, as well as the IMSA Michelin Pilot Challenge. In addition, RYMS is a precision CNC parts manufacturing organization with expertise in multi-axis machining of metal and plastic parts with complex geometries. RYMS' in-house production includes machined parts for the Ford FR9 V8 NASCAR programs, Ford Mustang 5.2L V8, and other motorsports, aerospace, defense and high-tech industries.

RYMS' quality management system is AS9100 Rev D & ISO 9001 certified, as well as International Traffic in Arms (ITAR) and Cybersecurity Maturity Model Certification (CMMC) compliant.

To help achieve its demanding performance and company goals, RYE chose Starrett precision measuring tools and metrology systems to ensure that critical design specifications are being met at the level expected and required by engineering. Motorsports, defense, aerospace, and medical manufacturing requires strict standards to achieve consistent quality. Add in complex requirements for high-performance and reliable parts, and the test and measurement processes are even more demanding.

RYE has two well-equipped quality labs which have the tools necessary to measure and inspect a wide variety of parts being manufactured and supplied for its racing engines as well as for external customers.

Rocker shaft measurement data from fixtured digital indicator stand is transmitted to laptop (left) or to inspector 200E across the plant (right).

Dogged by Data

Data integrity is a vital part of accuracy in precision manufacturing, especially so today. If the measurement data taken from precision gages is recorded, transmitted or logged incorrectly, several problems could occur. Parts can be scrapped, product performance could suffer, expensive production labor and machine time can be lost and excessive time will be spent logging data manually, which also increases the potential for error. In addition, none of the data can be officially documented or verified for SPC and traceable for customer requirements without a reliable automated system – one that can capture the measurement data to meet Industry 4.0 level manufacturing and make it available for integration with other data in the plant.

Understanding this and realizing the importance of achieving top data integrity, RYE reviewed its inspection and data acquisition process with Starrett, a forerunner in the development of data collection systems for quality control measurement applications. Starrett analyzed the conventional RYE data collection process and quickly determined that RYE would benefit greatly by utilizing the very latest in data acquisition technology – its DataSure® 4.0 (DS4) system.

“We are consistently looking for ways to improve and expedite our data collection process,” said Alex Marothy, Quality Control Technician/Programmer & Automation Lead at RYE. “Machinists and inspectors were writing down some measurements in log sheets which then needed to be keyed into spreadsheets on a computer, taking time and possibly leading to errors, as operators may misread gages or write down incorrect values.”

Being fully aware of these potential challenges and seeking to migrate more toward reliable seamless digital automation and leverage their data more efficiently throughout its facilities, RYE gave Starrett the nod to initiate DS4 mid-year of 2020. RYE opted to implement DS4 slowly, starting with a multiple digital indicator application fixture designed for engine inspection.

“DataSure® 4.0 is the first wireless system we have ever used to collect data on our manufacturing floor via in-process inspection, so we wanted to start small, verify the results and build confidence with our team,” said Todd English, Vice President, Strategic Partnerships & Marketing at RYE.

Data Surety by the Seconds

RYE manufacturing operations are carried out in two 80,000-square-foot facilities in Mooresville, with the DS4 application running in a 40,000-square-foot CNC machining area spanning from the front to back of the shop, transmitting data approximately 200 feet. In this area there are at least 15 CNC machines, so noise and signals are omnipresent, but despite the distance and potential ambient interference, DS4 operates smoothly via a remote gateway and an antenna.

Multiple Starrett Digital Indicators in engine-mounted fixture capture and transmit T.I.R. measurement data to computer devices.

Marothy described how the concept to deploy DS4 on the engine fixture system developed. “Previously engineers used an eight-dial indicator fixture system. The new plan was to utilize eight Starrett W2900-01 electronic digital indicators along with DS4 in order to attribute and organize both values to that specific indicator so that data entry and review would be very simple."

The results from applying DS4 to the engine fixture were impressive. “Compared to our previous methodology, we substantially improved our data collection accuracy and time, but even more importantly, the data was digitally transferred,” said Marothy. “The DS4 system effectively eliminated hand written gage readings and the transcribing of values into spreadsheets,” he explained.

On a different level, RYE evaluated DS4 another way via labor savings by determining how many seconds were saved per measurement. “We found that DS4 saved from 8 to 10 seconds per measurement, and we are doing several thousand measurements per day, thus saving over seven hours of labor every day,” said Marothy. RYMS’ Production Manager, Jennifer LaFever, also pointed out other systems-related benefits of DS4. “We practice continuous improvement strategies at RYE through our Kaizen program, which DS4 contributes to via its ability to help us be faster, more accurate and

efficient."

Impressive 200 ft. long CNC machining area in one of RYE's two 80,000-square-foot world class manufacturing facilities where Starrett DataSure® 4.0 is deployed.

Wireless Technology with Speed, Sans the Restrictions

The Starrett DataSure® 4.0 System operates on the latest wireless networking technology that uses short-wave radio frequencies to interconnect cell phones, computers and wireless electronic devices, enabling much faster speed, greater bandwidth and longer range for higher data throughput. The range of DS4 is 10 to 20 times that of any data collection system on the market, capable of transmitting data literally hundreds of yards, even over a mile, which is ideal in larger manufacturing operations or multiple facilities.

DS4 features higher bit rates and a very high-speed connection of less than 50ms of data travel time and has an ultra-low latency network that enables high data volumes to be processed without delay, even at full capacity. Users of DS4 can versatillely utilize multiple remote gateways and repeaters which serve as central or distributed points for data collection, versus conventional systems that have only one gateway.

DS4 is also built on a highly secure proprietary wireless platform. Transported data is encrypted using a multi-layered approach that absolutely prevents any outside access to the data, whether passive or active. "We have to be very vigilant of keeping all data on our physical parts in our network under strict security to meet CMMC and ITAR requirements and we are fully confident that DS4 meets the criteria," said LaFever.

With DS4, a new network topology can be configured to many simple or complex situations and distributed remote gateways can also be utilized. Data is transmitted from gages that have either built-in radio transmitters or externally-mounted end nodes to gateways, and is operable on Android or IOS mobile platforms and Windows®-based computers including laptops, desktop PCs, thin client PCs, and servers. DS4 repeater and bridge components can also connect directly to PLCs and other high-speed serial automation equipment for real-time data collection or remote machine operation.

DataSure is also compatible with all Starrett electronic digital gages, as well as electronic gages of other tool manufacturers and also works with gages that have built-in wireless capability, such as Starrett W798 Calipers, W733.1 Micrometers and W2900 Indicators, or via Starrett and other tool manufacturers' electronic gages by externally mounting Starrett DataSure End Nodes on the gages.

Building A Data Future

Recognizing the positive impact DS4 made in their manufacturing operation, RYE has bigger plans for data collection. “Ultimately we want to further leverage DataSure by integrating it into our ERP system for a full end-to-end data solution to help make our organization move more aggressively toward an Industry 4.0 digital factory,” said English. RYMS will also be expanding DS4 to other industry applications the company addresses, particularly in aerospace, medical and defense by broadening the use of DS4 throughout all of its gaging operations in CNC machining.

After asking RYE how would it know when DS4 would reach its fullest potential in the organization, Marothy was quick to reply. “We’ll know it’s working by the wins on and off the racetrack.”