ABTech inc.
Pride In Precision

CASE STUDY

How A Leading Automotive Transmission Component Manufacturer Improved Valve Quality with ABTech's High-speed, High-precision Metrology & Machining Lathe

ABTech is a supplier of ultra-precision metrology, motion, and custom-engineered air bearing solutions based out of Fitzwilliam, New Hampshire

The Challenge

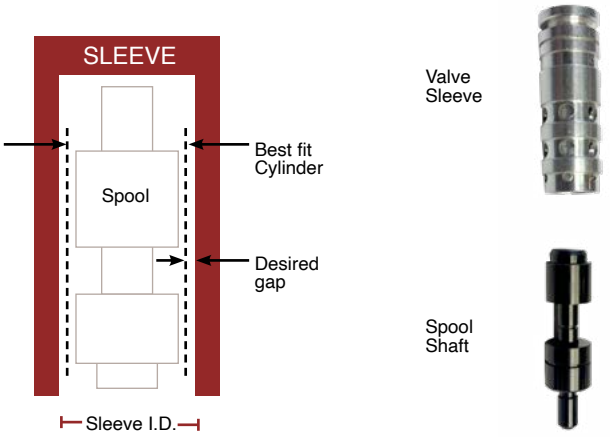
Variable part dimensions from overseas production

One of the most welcome benefits of overseas production is lower costs. But for a leading transmission component manufacturer, known for its aftermarket automotive transmission parts, inconsistent quality from foreign suppliers presented a challenge with bottom-line impacts.

The part that the manufacturer wanted to focus on was their replacement transmission valves. The main components include an inner spool shaft and its outer sleeve; the two must fit together perfectly—otherwise, transmission fluid would leak, causing clutch slippage. The manufacturer had built its reputation on aftermarket parts that perform as well or better than the original automotive equipment, and these replacement valves were no exception.

However, the fit from the overseas supplier was inadequate for high-end performance transmissions, racing, or rebuilds. To address this issue, the manufacturer came up with the idea to continue importing large quantities of affordable yet dimensionally variable spool shafts, but then machine a precisely matched sleeve for each one at their facility in the U.S. to achieve the quality needed.

With no commercial equipment capable of meeting requirements, the automotive manufacturer reached out to Ken Abbott, CEO of ABTech, for a work cell solution that would measure a spool's diameter, taper, and roundness and then machine a corresponding sleeve.



Requirements were clear: a perfect 5 µm (0.0002 in) gap from the largest diameter of the spool shaft to the inner diameter of the sleeve.

In addition to being highly accurate, piece part cost concerns meant that the work cell had to produce sleeves at high throughput and low scrap rates, taking no more than 2 minutes to measure a spool and machine a matching sleeve.

HIGHLIGHTS

Client: A leading automotive transmission component manufacturer with international distribution to more than 70 countries

Application: Air bearing metrology & 2-axis lathe (work cell)

Challenges: Measure and machine at high throughput

Results:

- Sleeves fitted within 5 µm
- Part production in under 2 minutes
- Years of ongoing service
- Returned manufacturing to the U.S.

Design & Engineering

A handshake of data from metrology to machining

ABTech knew they could engineer a solution for the customer, and that their teams would have to work together to develop it.

> *"Like many of our custom projects, we had to be really good at project management, not just knowledgeable in how to build an air bearing."* – ABTech's CEO, Ken Abbott

The manufacturer supports transmissions made by multiple auto manufacturers, including BMW, Mercedes, Toyota/Lexus, and Volkswagen/Audi. In other words, ABTech's solution would have to accommodate a range of different valve sizes.

First decision: should the solution be one machine, or two?

Certainly, it would save on footprint by putting the metrology and lathe onto a single machine base. However, the right choice for this automotive customer was two vibration isolation bases, one for metrology and one for cutting, allowing both devices to run simultaneously without affecting accuracy.

> *"They trusted us and gave us leeway. They had the confidence we'd do it right."*
> – ABTech's CEO, Ken Abbott

ABTech designed a metrology unit with an air bearing rotary table with work holding and a high-accuracy, non-contacting laser micrometer to measure and capture the dimensions of the spool shaft.

The next challenge was the transfer of data between the metrology station and the lathe. Extensive software development went into getting this information to the lathe controller. It had to coordinate a precise X and Y axis and an air bearing spindle to bore the exact inside spool diameter required to fit the two parts together.

To serve their automotive customers, the manufacturer wanted to complete the process in 2 minutes or less:

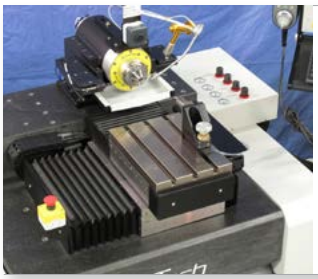
1. Measure the spool
2. Download the data to the lathe
3. Cut the corresponding sleeve

Results & Benefits

High-speed, high-quality parts production

A single worker could operate the finished solution on demand. At the metrology station, the operator would load the spool onto the rotary table and hit a go button to measure the spool shaft. The offset measurements would automatically transfer to the lathe.

Metrology station with:
- Vertical Z axis motorized linear air bearing column
- Counterbalance pulley with air bearing sleeve
- Motorized air bearing rotary table with part holding chuck
- High accuracy non-contact laser micrometer



Machining station with:
- Stacked X and Y axis motorized linear air bearing stage
- High speed air bearing spindle with pneumatic collet

Controller includes: Delta Tau motion controller
- Industrial PC with application software
- Operator control panel with remote pendant

The operator then loaded a blank sleeve into the tailor-made pneumatic collet on the lathe's spindle and hit the cycle start button. The lathe bored the precise inside diameter required, and the complete component could then be packaged together and shipped to an automotive transmission, rebuilding, or racing shop.

Starting with affordable, overseas manufacturing and improving final part quality with ABTech's work cell met all of the customer's goals:

1. Keeping valve costs competitive
2. Increasing quality through precision
3. Achieving speedy throughput

The custom air bearing project took eight months from inception to production. ABTech delivered the machine, unpackaged and set up the device, and trained personnel on its operation. Within days, the manufacturer created production-ready transmission components.

ABTech's solution was successful immediately, with no adjustments, modifications, or recalibration. Instead of entirely trusting off-shore sourcing channels, cost-competitive, quality parts could now be produced using American technology and expertise.

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ABTech specializes in custom air bearing precision motion devices. Do you have an idea for pairing metrology with machining for your process? We'd like to hear about it and work on a solution together.

Reach out to ABTech today.

Contact our precision-motion experts today!