

## VARIABLE VALVE TIMING PROGRAM

# Highlights

1

The most comprehensive VVT line in the aftermarket now features more than 550 VVT Solenoids, Sprockets and Kits

2

Advanced engineering and manufacturing deliver premium quality VVT components

3

Many NAPA® Echlin® and Tech Expert® VVT components include gaskets for an easier installation



## What's in your box?™



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LOOKS RIGHT. FITS RIGHT. PERFORMS RIGHT.

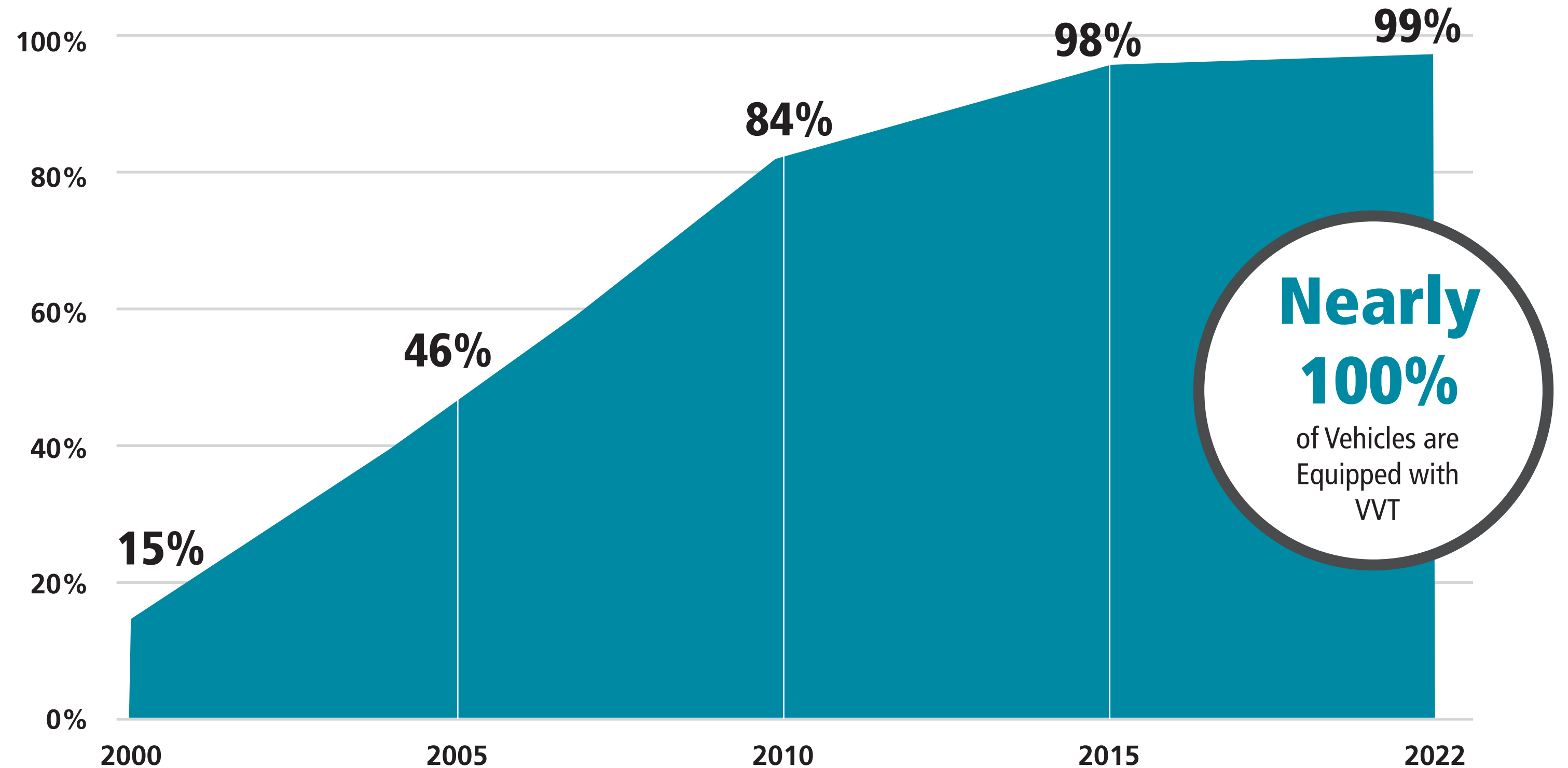
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# Growing Market

In an effort to increase fuel efficiency and elevate performance across today's vehicles, nearly every manufacturer has equipped new vehicles with Variable Valve Timing (VVT) technology.

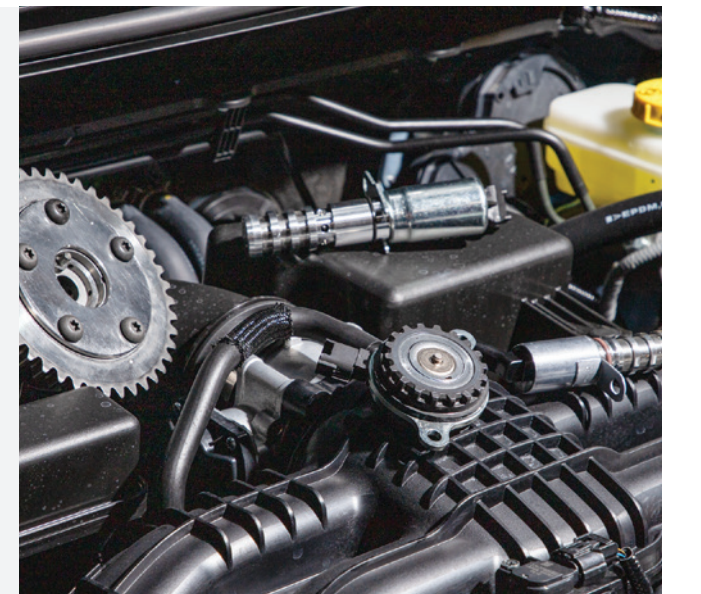
Time-in-service and oil quality both affect VVT components and eventually cause the need for replacement. The longer the system is in use, especially on today's vehicles with longer oil change intervals, the more likely the VVT system is to fail.

## Vehicles Equipped with VVTs



### Did You Know

In the next 5 years, 76 million more vehicles with Variable Valve Timing will enter the Aftermarket "Sweet Spot" (6-12 years old) during which their VVT sprockets and solenoids may need to be serviced or replaced.



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Variable Valve Timing

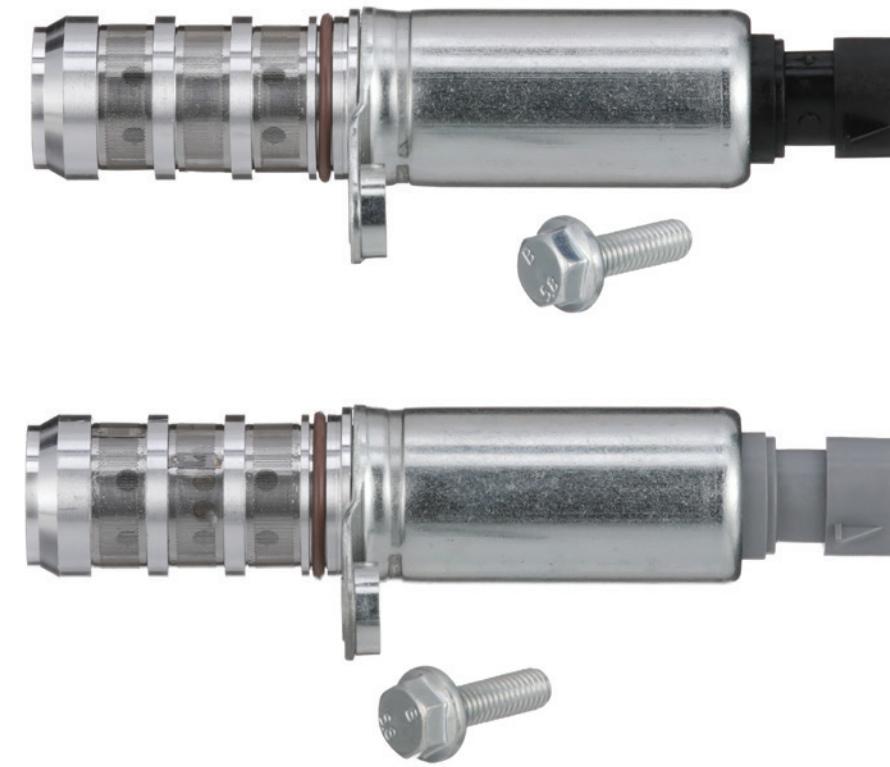
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# Sales Opportunities

The GM 2.4L and Toyota 3.0L / 3.3L applications are known to have high failure rates for VVT solenoids. We have these covered with kits that include improvements over the OE design.

NAPA® Echlin® and Tech Expert® offer a complete VVT Program to help address OE design flaws and get your customers back on the road.

## Rattling Noises and Unstable Idle on GM 2.4L



**Years:** 2017-06

**Make:** GM

**Engine:** 2.4L

**Common DTCs:** P0011, P0014, P0016, and P0017

**Symptoms:** Rattling noise at startup, unstable idle

**Solution:** Change the engine oil and filter during maintenance intervals and following VVT solenoid replacement

**Parts for the job:** VVS2000K

## Rough Idle on Lexus / Toyota 3.0L and 3.3L



**Years:** 2008-99

**Make:** Lexus / Toyota

**Engines:** 3.0L and 3.3L

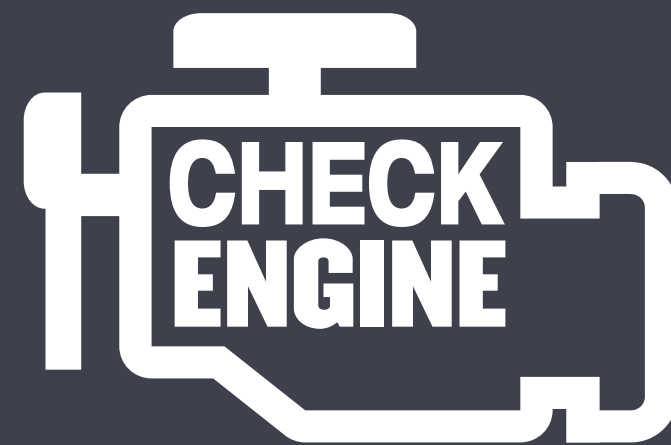
**Common DTC:** P1354

**Symptoms:** Rough idle

**Solution:** Maintain regular engine oil change intervals. When replacing the solenoids, replace the engine oil and filter

**Parts for the job:** VVS2001K

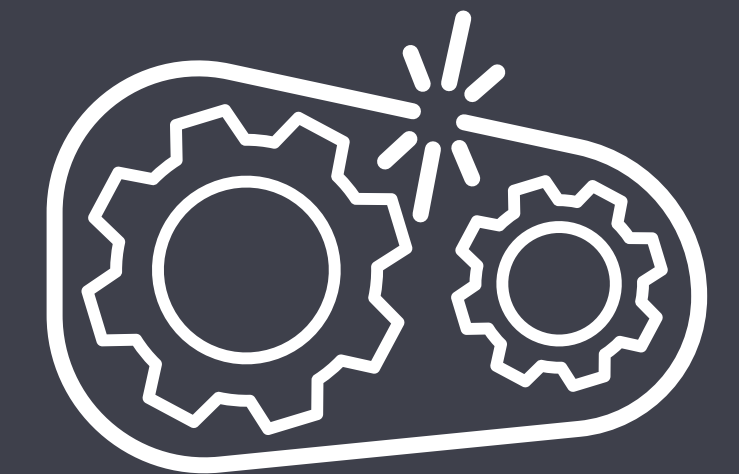
# Impact on Engine Systems



Rough idle, stalling, lack of power, decreased fuel economy, engine noise, and a check engine light may be signs of an issue with a VVT system



Using the correct oil weight is critical to the health of any variable valve timing system



When a VVT solenoid fails or is blocked, the lack of proper lubrication can cause the timing chain and gear to prematurely wear or break entirely

# What's New

VVT Solenoids, also known as control valves or spool valves, come in a variety of shapes and sizes to fit a multitude of applications.

NAPA® Echlin® and Tech Expert® are committed to regularly introducing new VVT Solenoids, adding to our industry-leading coverage.

For the most recent applications, check the online catalog at [NAPAEchlin.com](http://NAPAEchlin.com).



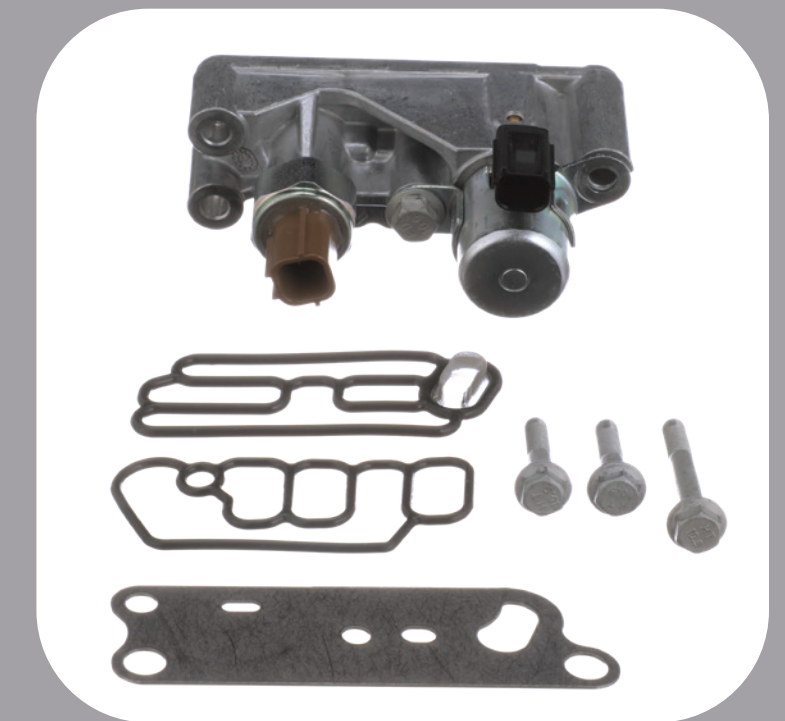
**VVS2062**  
Land Rover  
2.0L / 3.0L  
(2020-18)  
VIO: 149K



**VVS2066**  
Porsche Cayenne, Macan,  
Panamera  
(2020-18)  
VIO: 94K



**VVS1838U**  
Honda / Acura Cars & SUVs  
3.5L  
(2016-08)  
VIO: 2.5M



# What's New

VVT Sprockets, also known as cam phasers, account for nearly 250 SKUs in NAPA® Echlin® and Tech Expert's ever-expanding line of VVT component coverage.

For the most recent applications, check the online catalog at [NAPAEchlin.com](http://NAPAEchlin.com).



**ECP1968**  
Mazda Cars & SUVs  
2.5L  
(2022-17)  
VIO: 1.4M



**ECP1958**  
GM Trucks & SUVs  
6.2L / 6.6L  
(2021-19)  
VIO: 2.1M



**ECP1936**  
Hyundai / Kia Cars & SUVs  
2.0L  
(2021-13)  
VIO: 1.6M



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VVT Sprockets

[NAPAEchlin.com](http://NAPAEchlin.com)

# Top Movers: VVT Solenoids & Sprockets

**IMPORT  
APPLICATIONS**



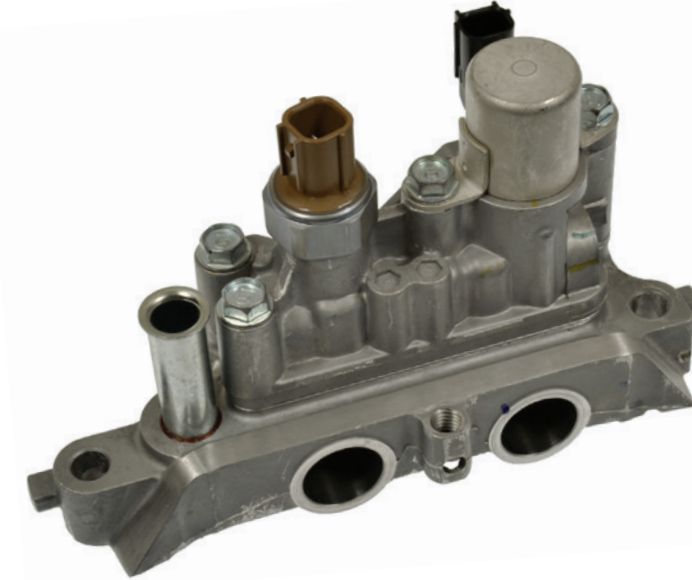
**VVS1512**

Honda Accord, CR-V, Element  
(2011-02)



**VVS1542**

Nissan Altima, Rogue  
(2020-13)



**VVS1838**

Honda / Acura Cars & SUVs  
(2016-08)



**ECP1871**

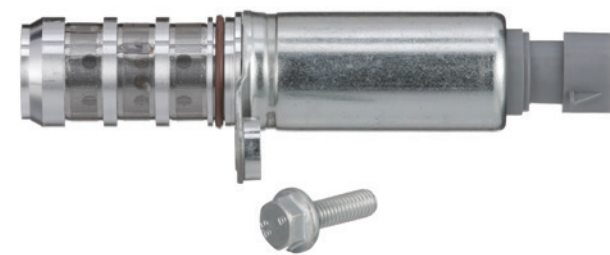
Honda / Acura Cars & SUVs  
(2015-09)



**ECP1920**

Hyundai / Kia Cars & SUVs  
(2023-14)

**DOMESTIC  
APPLICATIONS**



**VVS1754**

GM Cars & SUVs  
(2017-06)



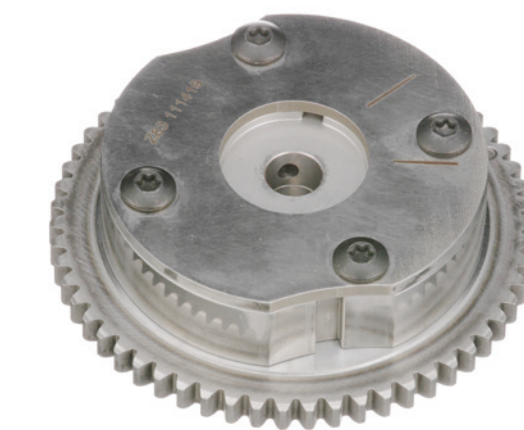
**VVS1755**

GM Cars & SUVs  
(2017-06)



**VVS1100**

Ford / Lincoln  
Cars, Trucks & SUVs  
(2014-04)



**ECP1757**

Ford / Lincoln  
Cars, Trucks & SUVs  
(2019-11)



**ECP1725**

GM Cars & SUVs  
(2022-07)



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VVT Components

NAPAEchlin.com

# Related Parts

In addition to the highest quality Sprockets and Solenoids, NAPA® Echlin® and Tech Expert® offer the complementary parts necessary to maintain and repair today's VVT systems.



## VVT Spool Filters

Spool filters can become clogged over time, hurting performance and potentially causing damage to the solenoids

NAPA® Echlin's replacement VVT Spool Filters allow technicians to service the filter and gaskets without replacing solenoids

Available for popular Honda and Acura applications through 2019



## VVT Chain Tensioner Kits

Worn chain tensioners can cause a vehicle to run poorly and can even lead to a catastrophic engine failure

NAPA® Echlin's VVT Chain Tensioner Kits include a new chain tensioner, gasket and seal for a complete repair

Available for popular Audi and VW vehicles with a high failure rate



## VVT Position Sensor Magnets

Newer VVT Systems may also incorporate adjuster magnets

NAPA® Echlin's VVT Position Sensor Magnets are a drop-in replacement part and include new seals to help prevent oil contamination

31 SKUs available with coverage through 2021



## Camshaft & Crankshaft Sensors

Grime, water damage and bad wiring can all cause camshaft and crankshaft sensors to fail

Each NAPA® Echlin® Cam and Crank Sensor undergoes a testing regimen that includes a 35-hour vibration test, chamber test, and more to ensure durability

More than 1,000 Cam and Crank Sensors available for import and domestic vehicles



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VVT Components

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# Sales Opportunities

Ford 5.4L engines feature highly technical VVT systems which are susceptible to failure. They typically fail due to low engine oil levels, poor oil circulation, or oil and filter change irregularities.

Tech Expert® offers a Complete Timing Repair Kit to solve this OE problem.

**VVK1000**  
**Complete VVT Repair Kit**  
Ford / Lincoln (2014-02)  
VIO: 3.1M



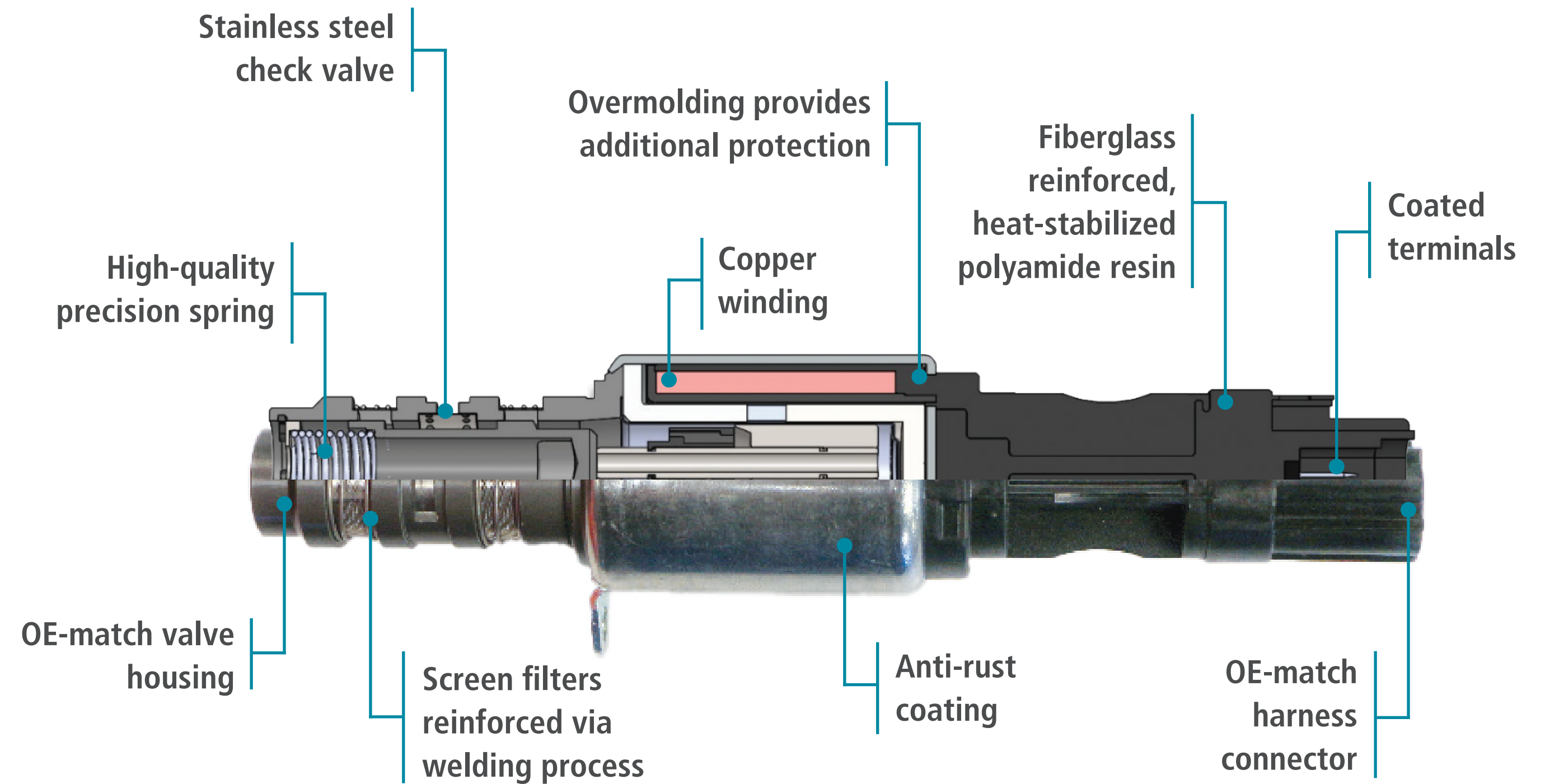
## VVT Kit Components

- 1 – VVT Sprockets
- 2 – VVT Solenoids
- 3 – Timing Chain Tensioners
- 4 – Timing Chains
- 5 – Timing Chain Guides & Tensioner Arms
- 6 – Drive Gear Sprocket
- 7 – Crankshaft Position Wheel
- 8 – Crankshaft Seal
- 9 – Gaskets

# Engineering Improvements

NAPA® Echlin® and Tech Expert® VVT Solenoids are direct-fit OE replacements designed to restore engine horsepower and torque curves, reduce emissions, and improve efficiency.

Premium parts start with premium components. Each NAPA® Echlin® and Tech Expert® Solenoid is engineered with features to ensure that they will perform under the most extreme conditions.



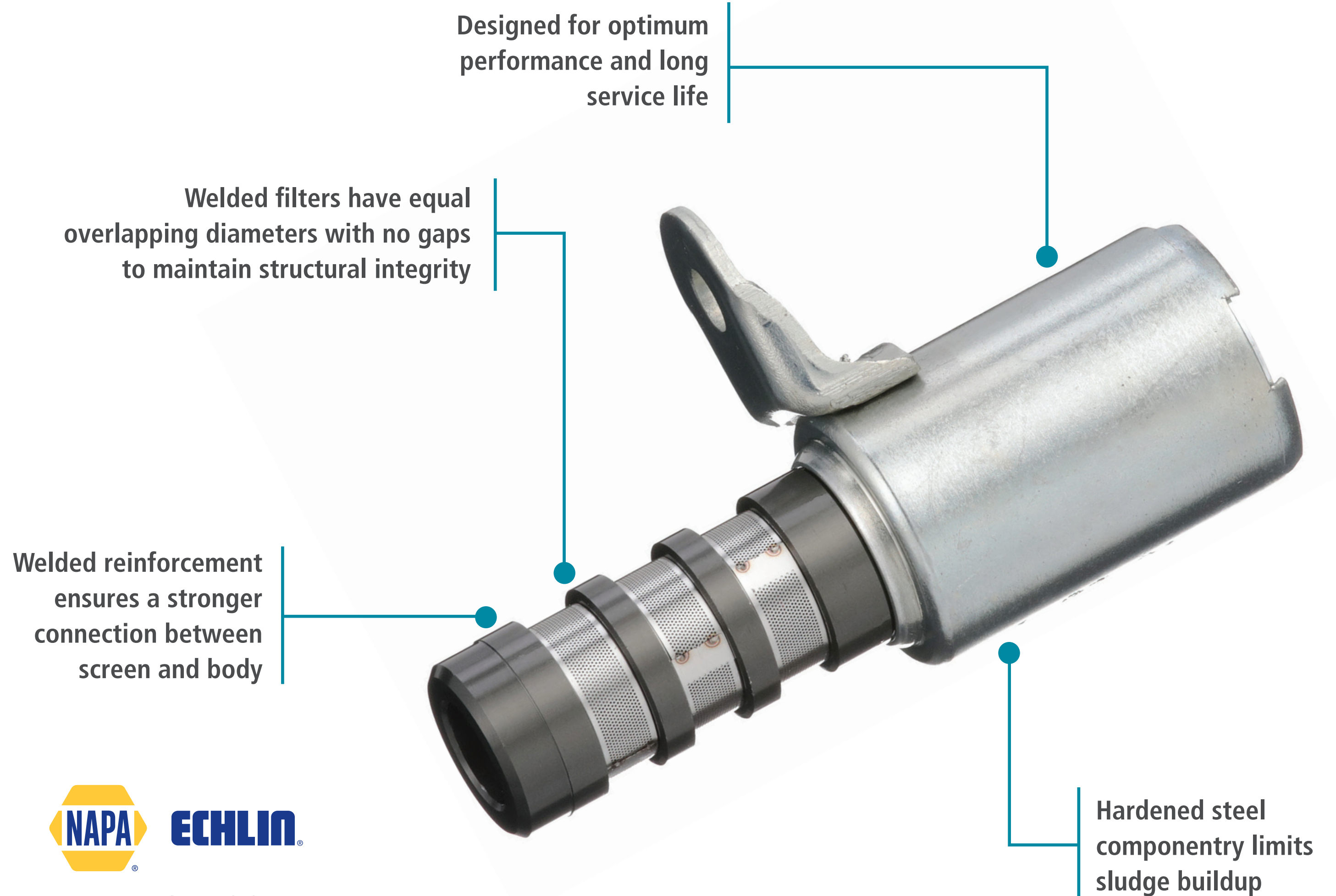
**VVS1100**

Ford / Lincoln  
(2014-04)

# Engineering Improvements

Generally located on and/or around the cylinder head, VVT solenoids meter the oil flow to control the actuation of the VVT sprocket.

Each NAPA® Echlin® and Tech Expert® VVT Solenoid features anodized steel componentry, which limits sludge buildup and protects against sticking. NAPA® Echlin® and Tech Expert® Solenoids also feature premium O-rings and gaskets to prevent oil leaks, as well as an OE-match harness connector.



**VVS1508**

Ford Cars, Trucks & SUVs  
(2020-11)

# Engineering Improvements

NAPA® Echlin® and Tech Expert® VVT Solenoids feature design improvements over the original and the competition.

Our improved screen stamp and welded reinforcement along with a reinforced plunger and spring are the result of NAPA® Echlin's commitment to high-quality design and rigorous testing.

OE



## Uses Plastic

OE uses plastic which often fails to hold the screen to the body

NAPA® Echlin®



## Reinforced

NAPA® Echlin® has improved screen stamp plus welded reinforcement

Competitor D



## Doesn't Match

Competitor has shorter solenoid length & minimal screen reinforcement

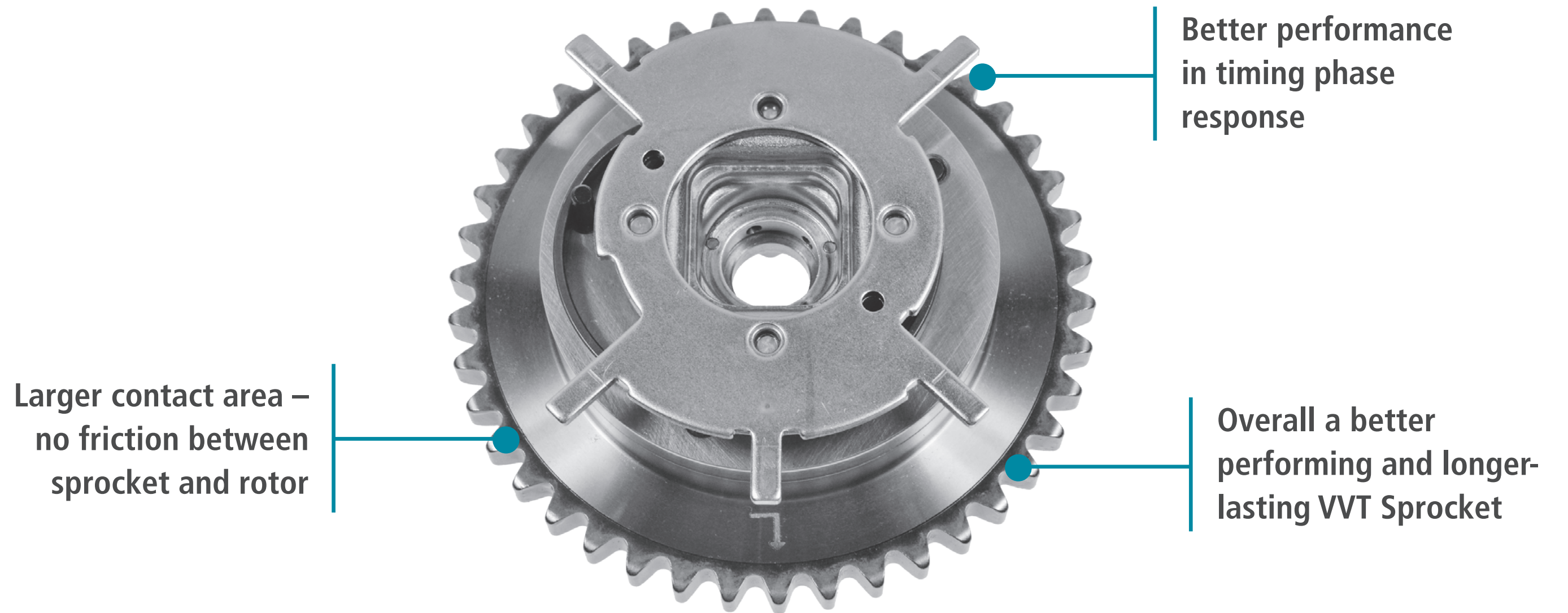
Source: SMP Testing Lab, 2020

# Engineering Improvements

Located on the camshaft, sprockets help maximize horsepower and torque curves, reducing emissions and improving vehicle efficiency. NAPA® Echlin® and Tech Expert® engineers have designed numerous improvements to our most popular VVT Sprocket for enhanced performance and long-lasting durability.

To ensure proper performance, NAPA® Echlin® and Tech Expert® VVT Sprockets are direct-fit OE replacements and meet tight dimensional tolerances to improve internal sealing, minimize oil drain back, and reduce frequency of PCM correction. The result is a better-performing, longer-lasting Sprocket.

## The NAPA® Echlin® Advantage



NAPA® Echlin® ECP1100

# Engineering Improvements

NAPA® Echlin® and Tech Expert® matches the original in all key tolerances and then improves on it with an all-metal integrated machined design – no paddle inserts to wear out, larger contact area, faster response times and longer service life.

The OE metal paddles may produce iron shavings that impede performance and shorten sprocket wear.

Competitor D uses plastic paddle inserts that wear easily and an “R” chamfer which can affect the timing signal.

**OE**



**Original - Metal Paddles**  
Produce iron shavings, paddles wear rapidly

**NAPA® Echlin®**

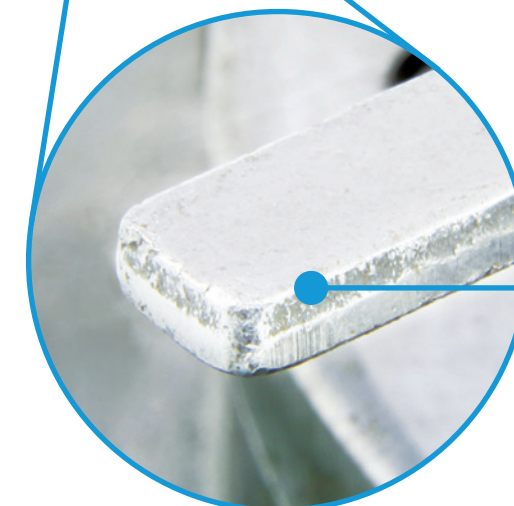
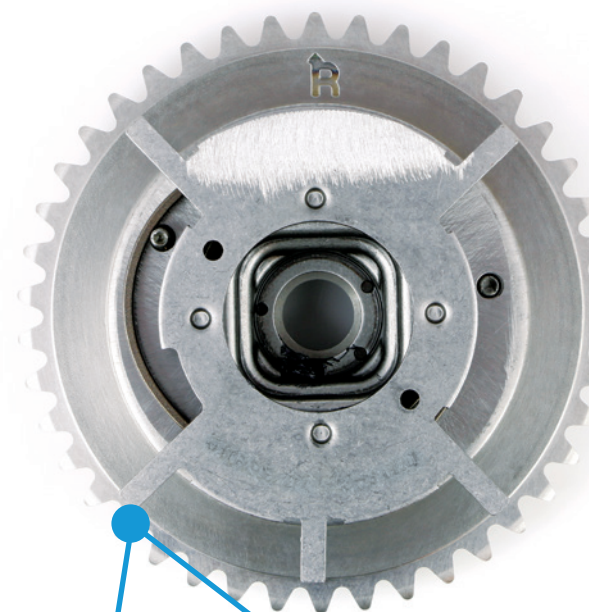


**Best – Integrated Design**  
Larger contact area with no paddle to wear out

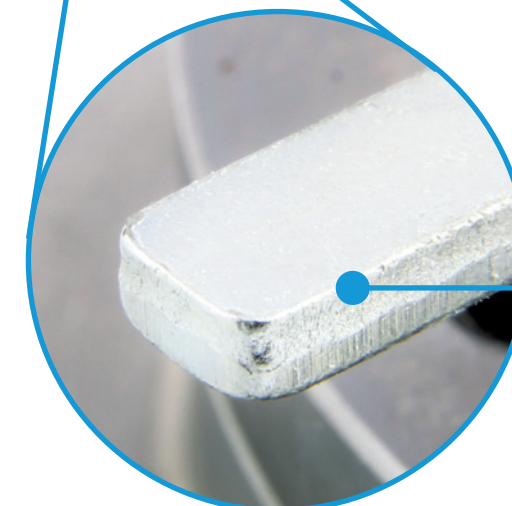
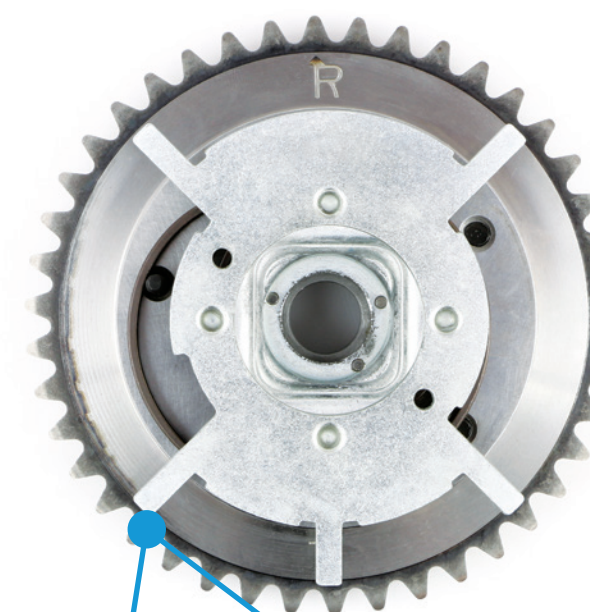
**Competitor D**



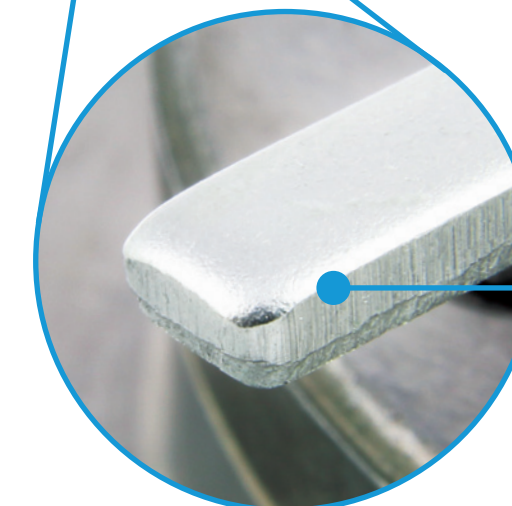
**Inferior – Plastic Paddles**  
Components wear easily



No R chamfer on signal-driven area



No R chamfer on signal-driven area



R chamfer on signal-driven area

Source: SMP Testing Lab, 2020

# VVT Design Improvements

NAPA® Echlin® and Tech Expert® VVT Solenoids feature a stainless steel shaft for a durable and more reliable solution while the OE and competitor units use other materials prone to deforming and wear.

The NAPA® Echlin® VVS1754 uses a stainless steel shaft, pressed all the way to the armature – this makes the shaft more durable for a reliable solution

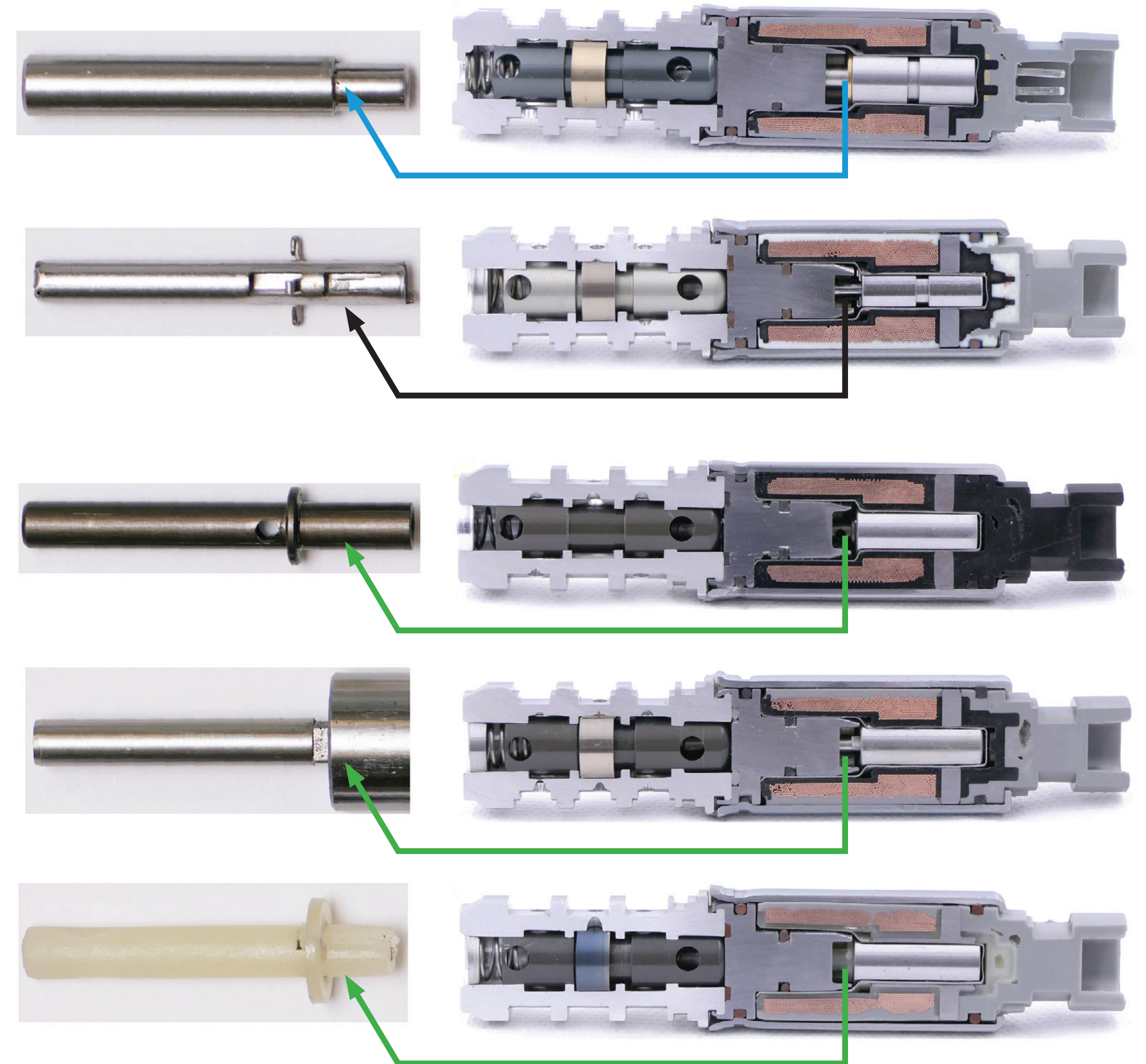
OE: Thin formed metal sheet as a shaft – prone to deformation, thus change of valve characteristics

Competitor 1: Aluminum shaft – prone to wear and change of valve characteristics

Competitor 2: Steel shaft pressed to a distance – prone to further pressing over time and change of valve characteristics

Competitor 3: Plastic shaft – prone to wear and change of valve characteristics

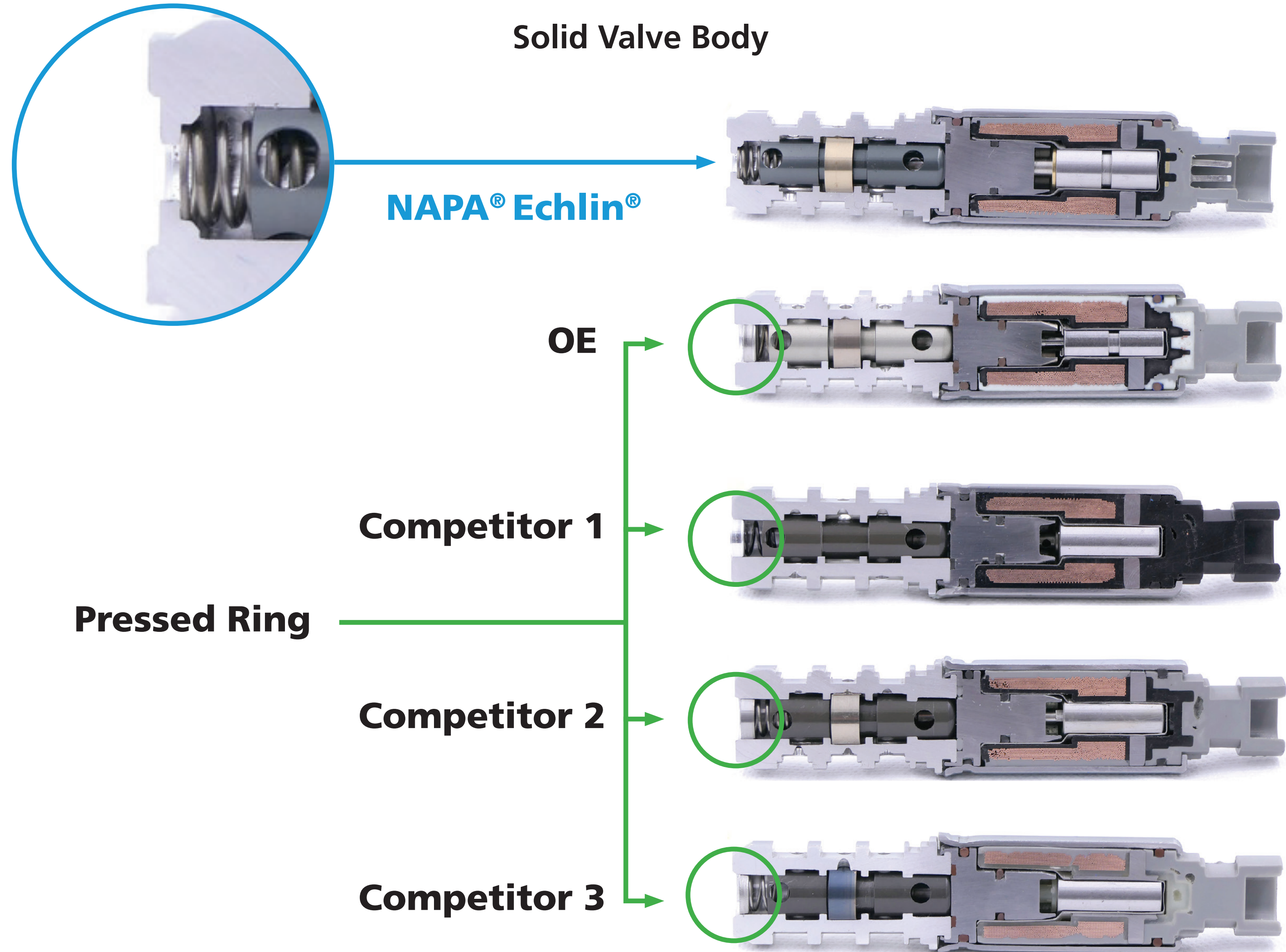
## Durable Shaft



# VVT Design Improvements

The OE and competitors' VVT solenoids use pressed rings for spring support that can fall apart over time.

NAPA® Echlin® and Tech Expert® VVT Solenoids feature a closed valve body for spring support, with no chance of falling apart, even after millions of valve switches.



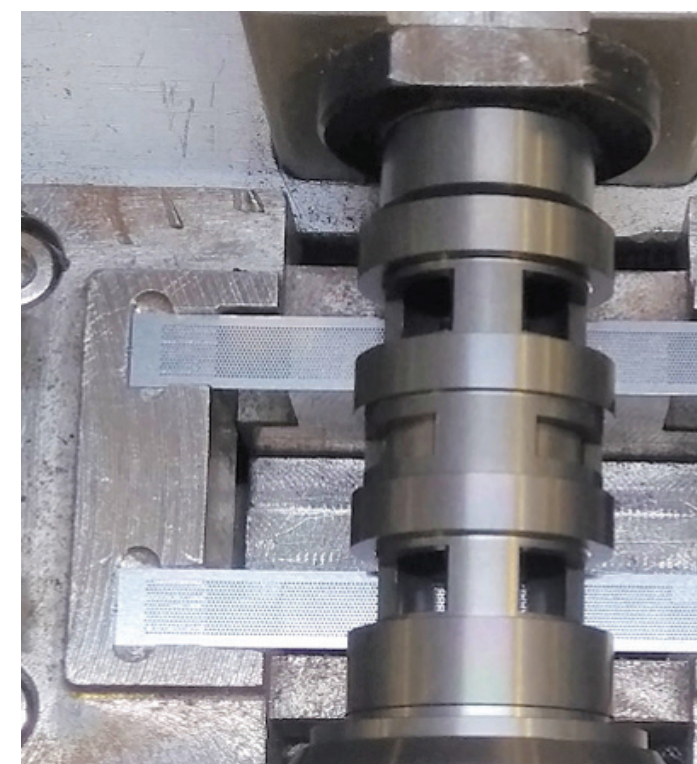
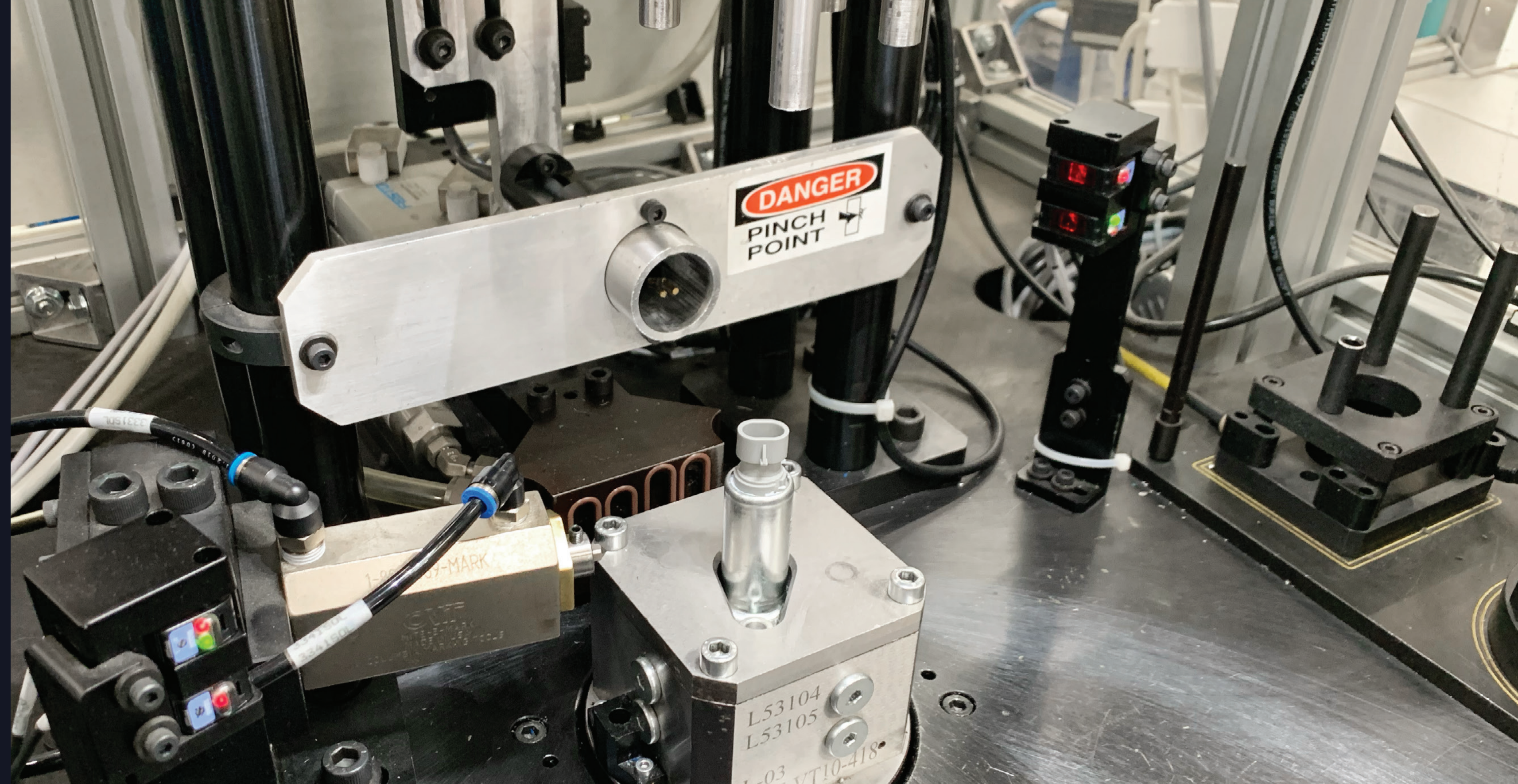


# Manufacturing

NAPA® Echlin® and Tech Expert® VVT Solenoids and Sprockets are designed and manufactured at our IATF 16949-certified facility in Bialystok, Poland.

Spanning 145,000 square feet, our most advanced facility has more than 750 employees including 60+ resident engineers.

Dedicated to producing the highest quality parts available, this plant produces millions of components annually while introducing more than 110 new products each year.



## Commitment to Continuous Improvement

Our dedication to continuous improvement practices in design, engineering and manufacturing allows us to make enhancements to the OE design, while maintaining complete control over each NAPA® Echlin® VVT component.

# Testing and Validation

NAPA® Echlin-manufactured VVT Solenoids and Sprockets undergo extensive measurement and life testing, plus a full spectrum of environmental analysis. This regimen includes thermal shock, thermal cycling, salt spray, vibration, storage tests, dirty oil tests, and more.

The result is a line of premium VVT components that perform flawlessly and stand up to real-life conditions.



# NAPA® Echlin® Pro Training Tech Tip

As experienced ASE-certified automotive technicians themselves, NAPA® Echlin® Pro Trainers are experts in VVT system technology. Here's what they say to look out for during a VVT component install.



**Using a lab scope and referencing a “known good” cam/crank pattern is a very accurate method for diagnosing failed timing components**



**Always change the engine oil and filter when replacing a VVT solenoid or sprocket**



**If one solenoid or sprocket fails, it's likely the other VVT components are nearing the end of their service life too – It's suggested to replace both solenoids and sprockets at the same time and inspect/replace all related timing chain components in the VVT system**



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VVT Components

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# NAPA® Echlin® Professional Training

Award-Winning In-Person, Live Virtual, and Online Learning

NAPA® Echlin® Pro Training delivers accredited classes that educate technicians in the latest automotive repair technologies, and techs can earn CEU credits.

An extension of NAPA® Echlin® training, our extensive YouTube video library has over 500 technical and installation videos.



## Available Classes

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Variable Valve Timing

Nissan VVT Diagnosis

Variable Valve Timing Fundamentals

Modern Valve

Diagnosing GM Variable Cam Timing

Ford Variable Valve Timing



## Available Classes

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Toyota / Lexus Diagnostics

Nissan / Infiniti Diagnosis

Ford EcoBoost

Ignition and Cam / Crank Synchronization

Labscope Power-User



For information on replacing VVT and components, search “VVT” on the **NAPA® Echlin®** YouTube channel

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