

# 6.0L Diesel Talk LIVE



**Improved 6.0L Power Stroke  
Injector Spool Valve Sticking Reflash:  
Inductive Heating Strategy**

**February 7, 2007**

# Diesel Talk Live

- **Today - Improved 6.0L Power Stroke Injector Spool Valve Sticking Reflash: Inductive Heating Strategy**
- **Presentations will be available on Power Stroke Central**
  - **Links to streaming video will be available on Power Stroke Central**

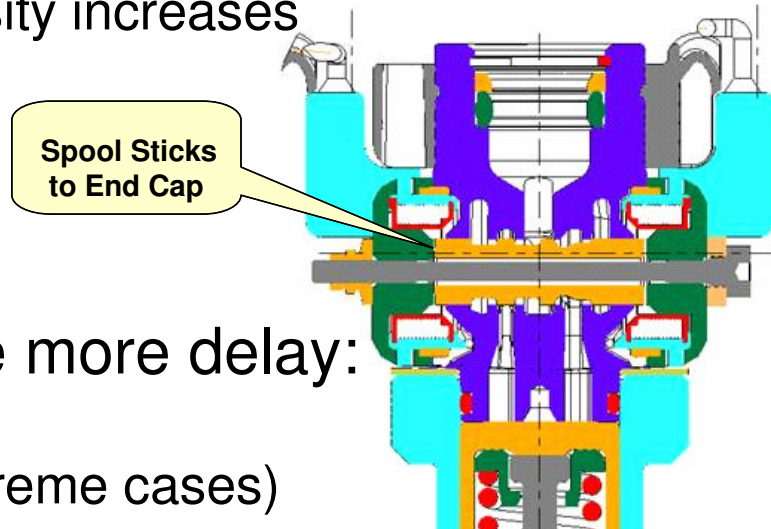
# Taped Rebroadcast Dates

## Ford Dealer TV – Channel 11

<b><i>Topic</i></b>	<b><i>Date</i></b>	<b><i>Time (ET)</i></b>
<b>Improved 6.0L Power Stroke Injector Spool Valve Sticking Reflash: Inductive Heating Strategy</b>	<b>2/13/2007</b>	<b>4:30 - 6:30pm</b>
	<b>2/14/2007</b>	<b>9:00 - 11:00am</b>
	<b>2/15/2007</b>	<b>8:00 - 10:00pm</b>
	<b>2/20/2007</b>	<b>11:00 - 1:00pm</b>
	<b>2/21/2007</b>	<b>8:00 - 10:00am</b>

# Cold Injector “Stiction” - What is it?

- Stiction is caused by excess oil in the closed side end cap/spool interface area increasing the hydraulic latching of the spool valve
  - Stiction increases as oil viscosity increases
    - Temperature decreases
    - Oil viscosity changes
      - Oil ages
      - Oil additives
      - Oil type, weight



The colder and thicker the oil, the more delay:

Rough idle

Lacks power/no pedal response (extreme cases)

White smoke

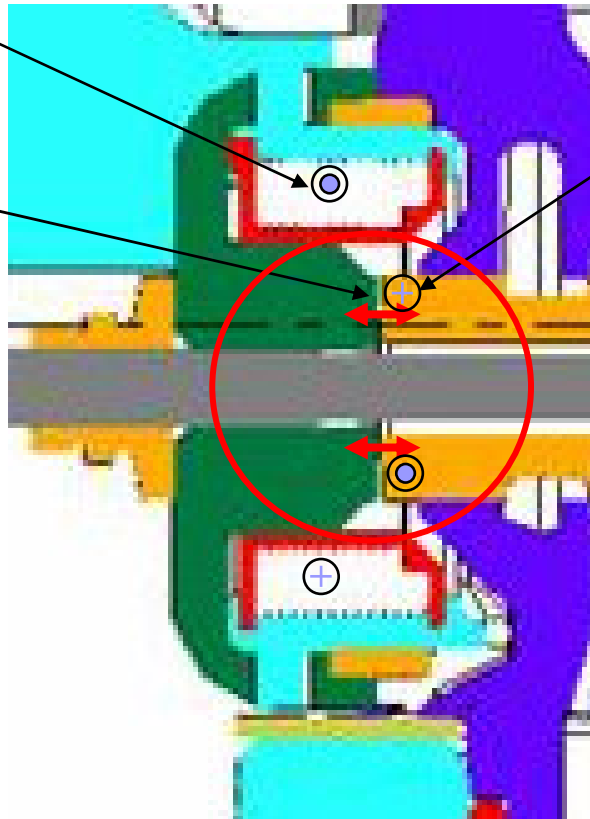
NOTE: issue corrected in 6.4L with common rail injector – Piezo vs. oil actuation

# Cold Injector “Stiction” – Inductive Heat Solution

- A NEW Inductive Heat software solution has been developed and extensively tested in the lab and field over the past year. This is different from the post-cycle calibration released last October.
- The new calibration applies current pulses to the injector coils in between injection events, which inductively heats only the interface between spool and endcap. This causes the oil in that critical interface to be heated MUCH more rapidly than by simply leaving the coils on longer, as with the post-cycle calibration.
- As with Post-Cycle, this heat makes the spool valve behave as it does when the EOT is hot. The difference is that the heating method (Inductive vs. straight DC heat) is much faster.
- This is a permanent fix, more effective long-term than injector replacement (since any injector can develop stiction)

# Inductive Heating - Close Coil as Transformer

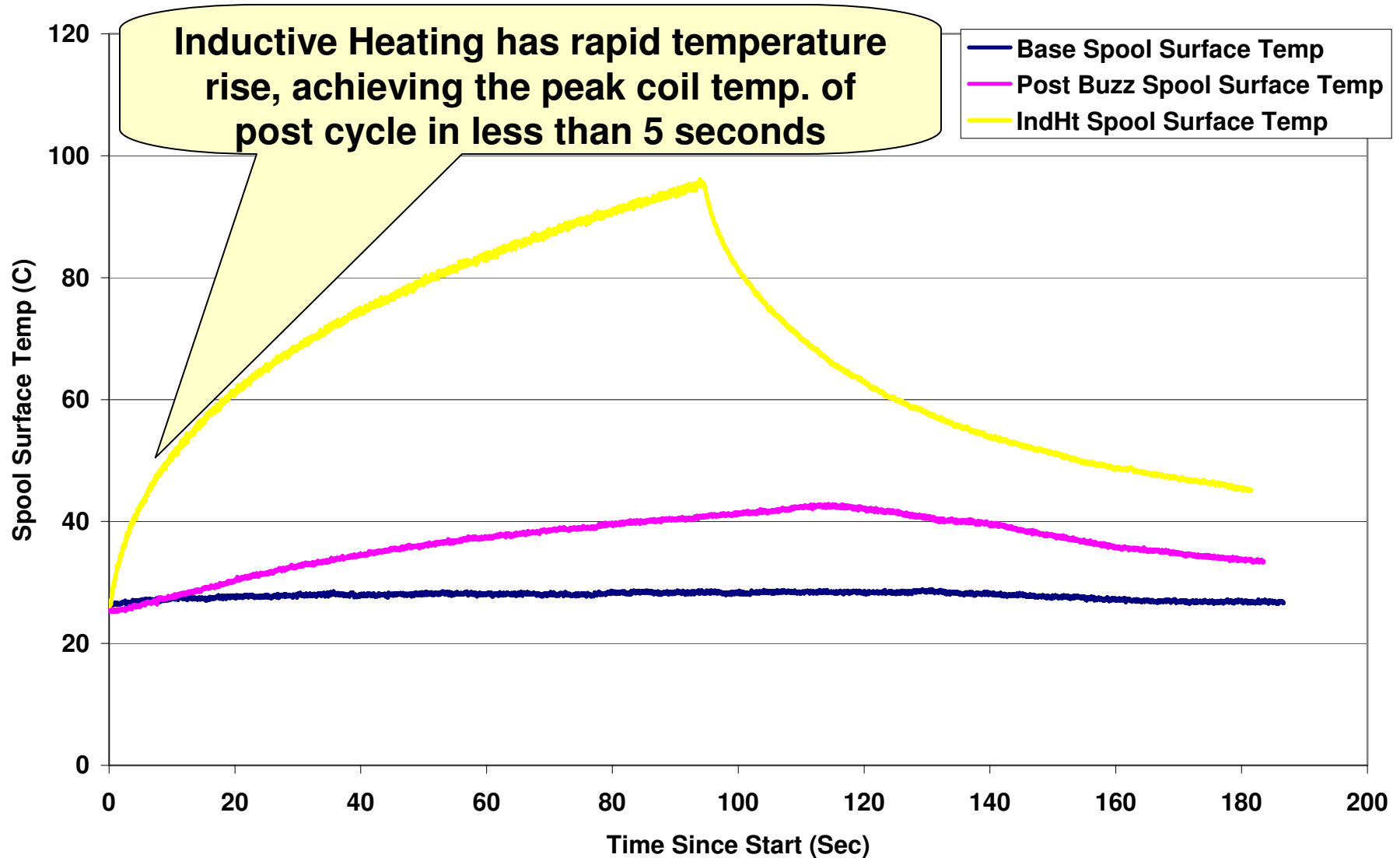
Changing current in "primary" creates changing magnetic field



Changing magnetic field creates current in 1-turn secondary

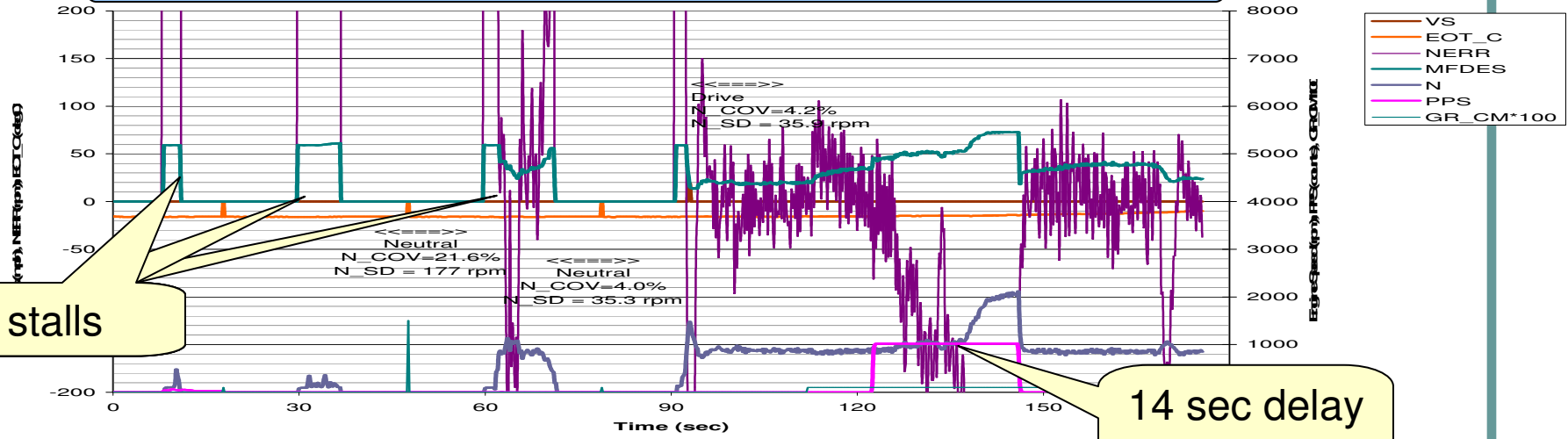
This generates heat in area where "stiction" occurs.

# Inductive Heating vs. DC Heating - Spool Temperature Rise Rate



# Induction Heat vs. Post Cycle - 0° F Cold Start w/ Worst-of-Worst (WOW) Injectors

Post-Cycle



3 stalls

14 sec delay on accel

Induction Heat



0 stalls

no delay on accel



# Video Demonstration

- 2006 F-250 6.0L
- 17,000 miles
- Mild stiction
- 5° F ambient temperature
- Overnight cold soak
- No block heater

**Baseline FICM calibration vs. Inductive Heat**

# Revised TSB Procedure Detail

1. Receive vehicle with **cold driveability** symptoms
2. Reflash
3. Evaluate start/run behavior and determine if original problem is corrected. If so, return vehicle to customer (no road test is needed).

# Revised TSB Procedure Detail

- Vehicles which were previously flashed with Post-Cycle calibration (TSB 06-22-3) do not need to be updated with Inductive Heat unless they still have cold driveability symptoms.
- The E-Series wiring modification is no longer required (since injector post-cycling is not needed with Inductive Heat)
- Wiring modifications made on E-Series vehicles do not need to be undone.

# Customer Information Sheet – No longer needed for Induction Heat



## **6.0L Powerstroke Engine Control Improvement Software**

Your vehicle received revised engine control software to improve engine operation by cycling the fuel injectors every time the engine is shut off.

You will notice a soft buzzing sound from under the hood after the ignition key is turned off. This is expected. The cycling is very difficult to hear inside the vehicle but it can be heard from the outside. The new software will not reduce engine life, fuel economy, or performance.

The injector cycling sound will last for 30 seconds after every engine shut down.

## Two Important Things to Remember About Inductive Heat

- It works in run (KOER) mode only, after the engine starts.
- Therefore, cold engine tests to diagnose stiction are not needed – in fact, they will give misleading results because the strategy is not active.

**So, DO NOT use power balance or click/buzz test to identify stiction injectors on a cold engine!**

## Why Click/Buzz test is not effective for detection of stiction

- Click/Buzz test does not heat the injector, so no stiction compensation is provided.
- Click/Buzz test does not energize the injector coil long enough to overcome cold stiction delay when EOT is below 80°C.

**Therefore, DO NOT use click/buzz test to identify stiction injectors on a cold engine!**

**(cold = EOT below 80°C)**

## Why Power Balance is not effective for detection of stiction

- In Power Balance mode, Induction Heat is turned off when entering Manual Injector Balance Test.
- Therefore, power balance mode on a cold engine can cause misdiagnosis – since the engine does not normally run without Inductive Heat.

**Therefore, DO NOT use power balance to identify stiction injectors on a cold engine!**  
(cold = EOT below 80°C)

# Release of Inductive Heat FICM Calibration

- FICM calibrations are tied to PCM calibration releases
- PCM calibration releases are staged to happen during the next 2 weeks
- All calibrations expected to be released by 2/23
- TSB will be released at that time



# Question ?

- 1. When do I need to undo Econoline wiring changes that may have been previously made?**
  - A. Only for 2003 Model Year**
  - B. Don't undo any changes**
  - C. Only when the customer tows a trailer**
  - D. When there are cold driveability symptoms**

# Question ?

**2. Do I need Reflash all vehicles that have the injector Post Cycle calibration (TSB 06-22-3)?**

**A. Yes**

**B. No**

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## Q & A

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