



***Jacobs Vehicle Systems™***

# On Engine Brake Noise

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Systems December, 2000

# Overview



- *Engine Brake Description & Use*
- *Vehicle and Engine Brake Noise*
- *Focus on Mufflers & Configuration*
- *What is Jacobs Doing*
- *Community Concerns & Actions*

# What is a Jacobs Engine Brake™ ?

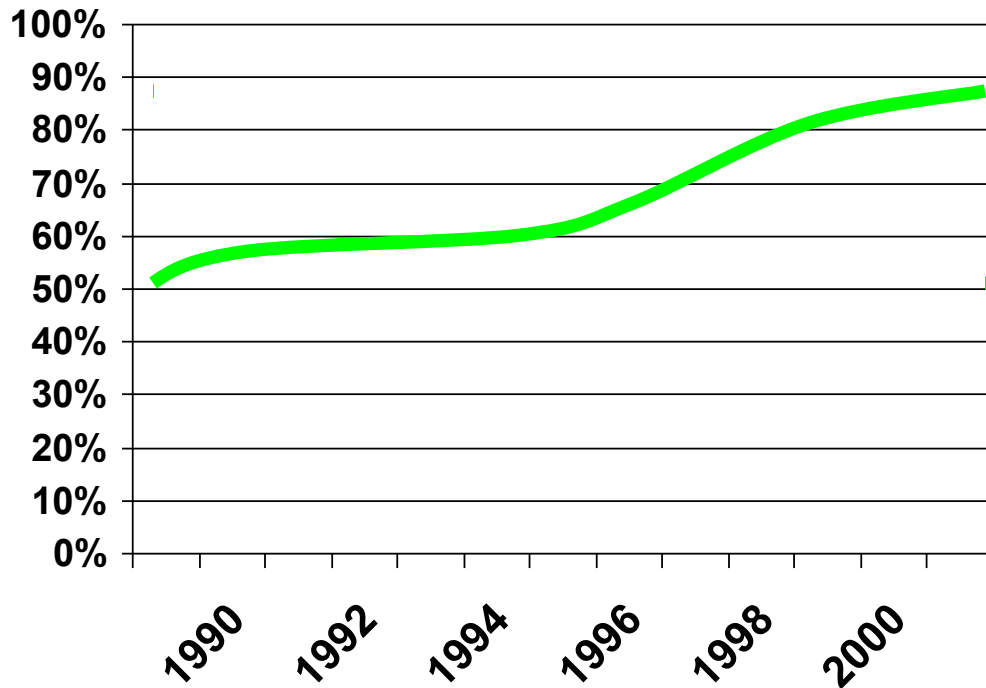


Jacobs Model 340B for  
Caterpillar 3406E Engine

- ***Supplemental vehicle retarding device***
- ***For diesel-powered vehicles***
- ***Mounted on engine overhead above valves***
- ***Converts a power-producing engine into a power absorbing air compressor by opening exhaust valves at or about compression top-dead-center (TDC).***

# Who Uses Engine Brakes

## North American Engine Brake Penetration Class 8 Trucks



*Additionally, engine brakes are also used on buses, vocational and off-highway equipment.*

# Jacobs Product Applications

**CATERPILLAR**<sup>®</sup>



**DETROIT DIESEL**  
CORPORATION

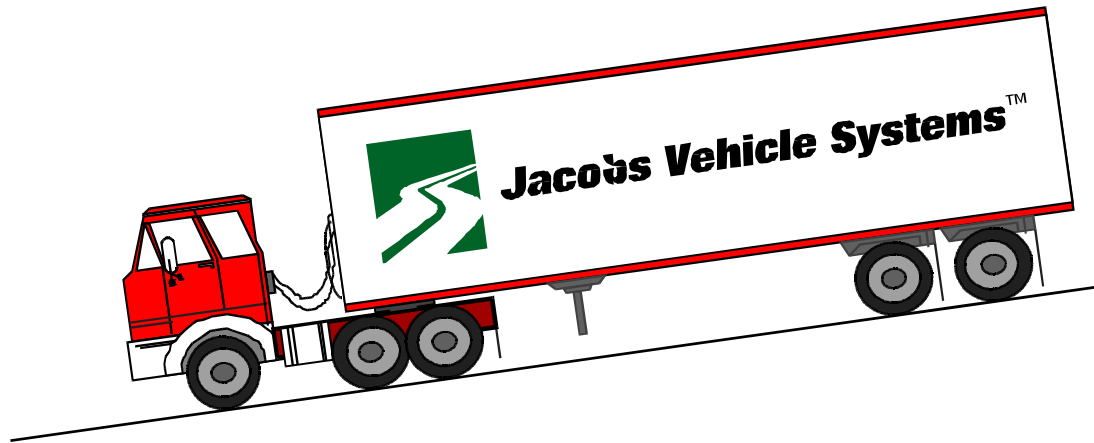


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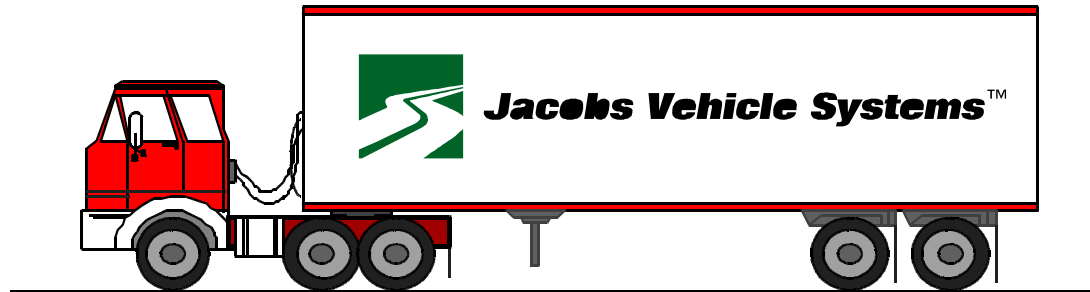


# Why Use Engine Brakes?



- ***Controls vehicle speed with minimal use of wheel brakes on downhill grades, in flatlands and in traffic***
- ***Minimize speed differential between cars and trucks***
- ***Reduces wheel brake maintenance frequency and cost and increases tire casing life***

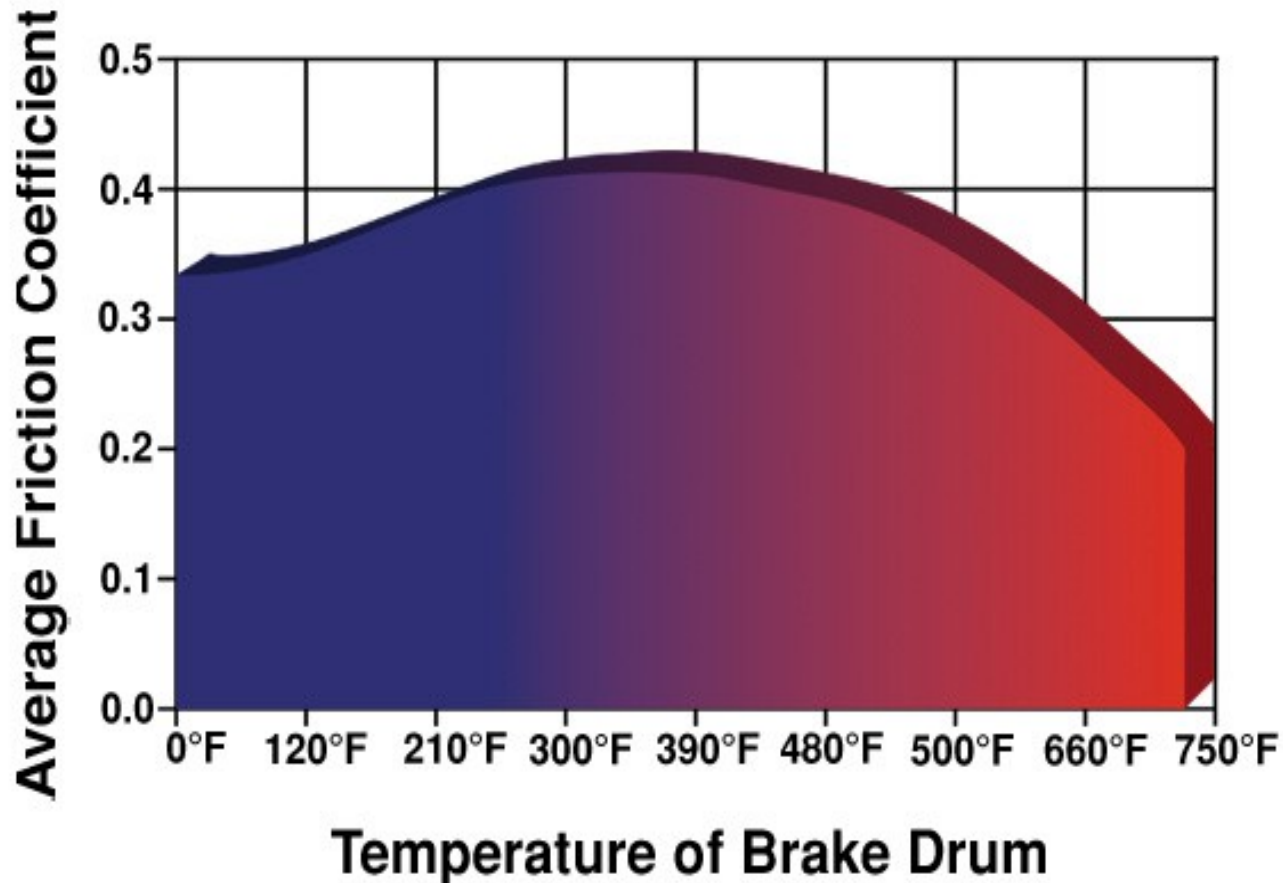
# Why Use Engine Brakes? (continued)



- ***Total Integration of engine brake into specialized vehicle control systems:***
  - Cruise Control
  - Collision Warning Systems
  - Auto-shift transmissions
- ***Engine Brake activation is automatically controlled by these control systems***
  - Driver cannot deactivate

# Why Use Engine Brakes? (continued)

- *Helps to prevent dangerous brake overheating & fade*

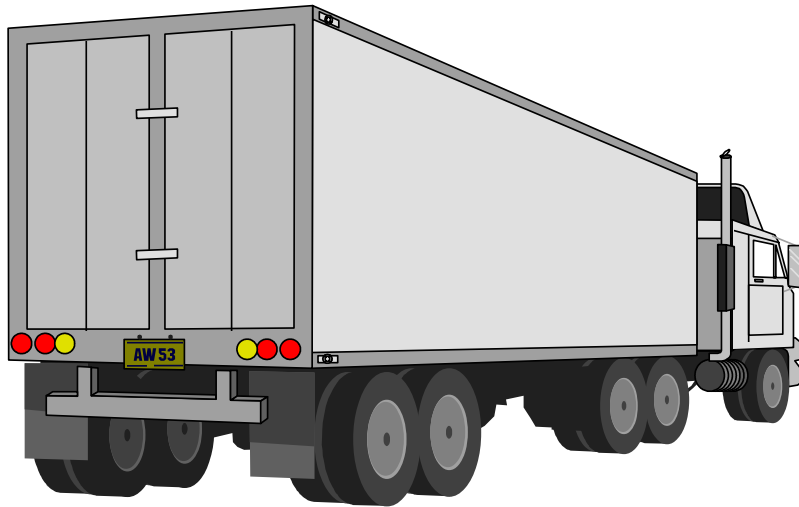




# Proper Exhaust System Configuration is the Answer



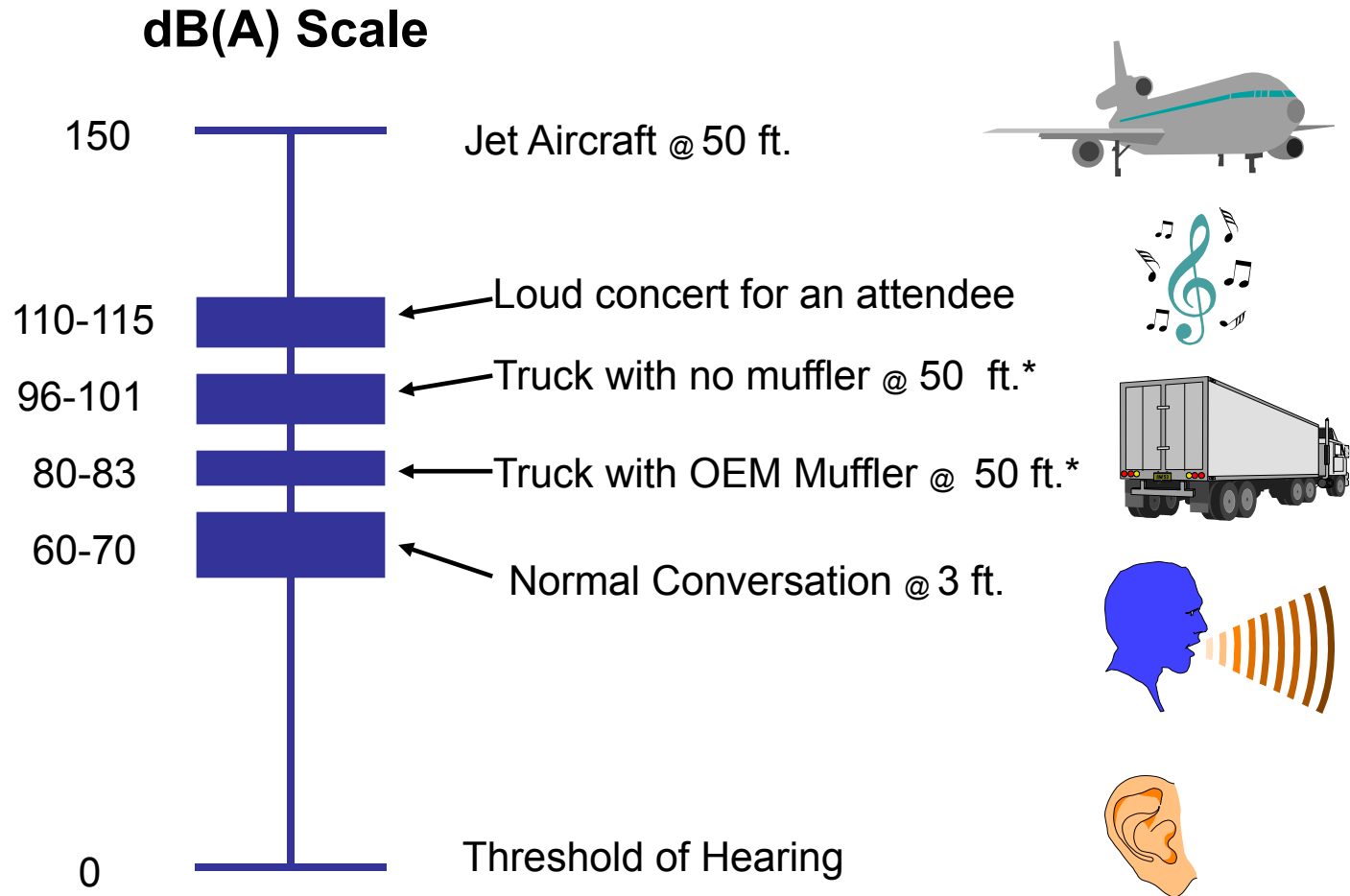
# Vehicle Noise Sources



- ***Exhaust Noise***
  - Engine Combustion Noise
  - Engine Brake Noise
- ***“Rest of Truck” Noise***
  - Tire & Road Noise
  - Intake & Turbo Noise
  - Fan & Mechanical Noise
  - Drive Train Noise
  - Chassis Noise

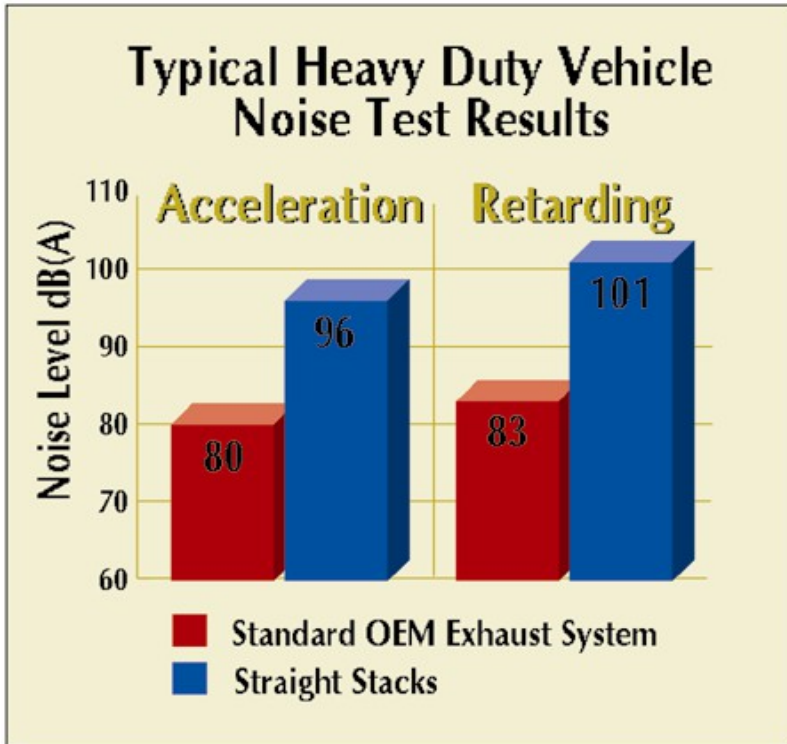
Engine Brake Noise is a component of exhaust noise and is similarly controlled with a functioning muffler.

# Sound Pressure Levels - Human Perception



\* Range of Truck Noise Level in Full Acceleration and Full Braking

# Characteristic Engine Brake Sound



Not a large difference between engine brake and acceleration sound levels, but a very noticeable difference when the engine is properly muffled.

- ***Created by sudden release of high pressure air into exhaust manifold***
- ***Distinctive and easily recognized.***
- ***Generally described as a staccato sound or “Bark”***
- ***Usually slightly higher noise level in retarding than in acceleration***
- ***Much higher noise level for defective mufflers and no mufflers.***

# Focus Should Be On Mufflers



- ***Install and Maintain Proper Mufflers:***
  - Controls noise during acceleration as well as braking
  - Drivers exposed to less on-the-job noise
  - Local residents exposed to less noise

# Controlling Engine Exhaust Noise

- ***Proper engine exhaust system maintenance is the key to controlling engine brake sound levels***
  - Lack of mufflers are the worst offenders by a significant amount
  - Use of proper muffler, outlet pipe and orientation for the vehicle as specified by vehicle builder and federal mandate
  - Higher performance mufflers are available if greater noise suppression is required
- ***Total vehicle noise is comprised of other factors in addition to engine exhaust noise.***

# Truck Noise Emission Control Regulations

- ***EPA has regulated truck noise since the mid-70's under 40 CFR Part 205***
  - **New trucks are certified under a full throttle drive-by test.**
  - **Noise control performance of new vehicles must be warranted by the manufacturer to the end purchaser.**
  - **The manufacturer must communicate to the end user what constitutes “tampering” with the vehicle noise control system.**
  - **The manufacturer must also provide instructions to the end purchaser for proper maintenance, use and repair of the vehicle noise control system.**
  - **Tampering by dealers, repair personnel, end purchasers and operators is prohibited.**

# What has Jacobs been doing...



- *Jacobs has been working with states and municipalities that have posted no engine brake signs to assist in implementing reasonable and effective noise control regulations and signs.*



- *A Truck Maintenance Council Task Force on Engine Brake Noise has been formed. It has developed a recommended practice for muffler noise control rating and marking to facilitate “proper” maintenance. Additionally, Jacobs has developed muffler identification guidelines for vehicle inspections.*



- *Jacobs is supporting the industry in exhaust noise research. Joint development between Jacobs and muffler manufacturers has resulted in premium, high performance mufflers.*





# Elimination of “No Engine Brake” signs has benefits



- Truckers will be free to utilize the safety benefits and cost effective engine retarding equipment they have come to depend on.
- Safer vehicles and therefore safer public roadways
- Increased vehicle productivity
- *Any signage should address existing or new muffler requirements*

# Benefits to Community

- ***Enforcement of existing muffler requirements or addition of state-specific muffler regulations will reduce noise.***
  - Colorado law HB1144 \$500 fine imposed on commercial vehicles that do not have a muffler.
  - Oregon prohibits unmuffled engine brakes from being used, except in emergencies, otherwise fining drivers \$500
  - Maryland inspects vehicles for mufflers and will issue a \$50 fine for the first offense (progressively higher thereafter), and requires re-inspection of vehicle for compliance before vehicle is allowed back on the roads.

# Conclusion

## What Can Be Done?

- *Regulate when necessary the causes, not symptoms.*
- *Support enforcement of existing noise laws.*
- *Encourage use of proper mufflers and muffler maintenance procedures.*
- *Muffler identification procedures are available to inspect exhaust systems for proper configuration and condition.*
- *Implement muffler inspection as part of current roadside commercial*

