Retrofit Application Engineering

Manufacturers of Emission Controls Association
Pacific Oil Conference

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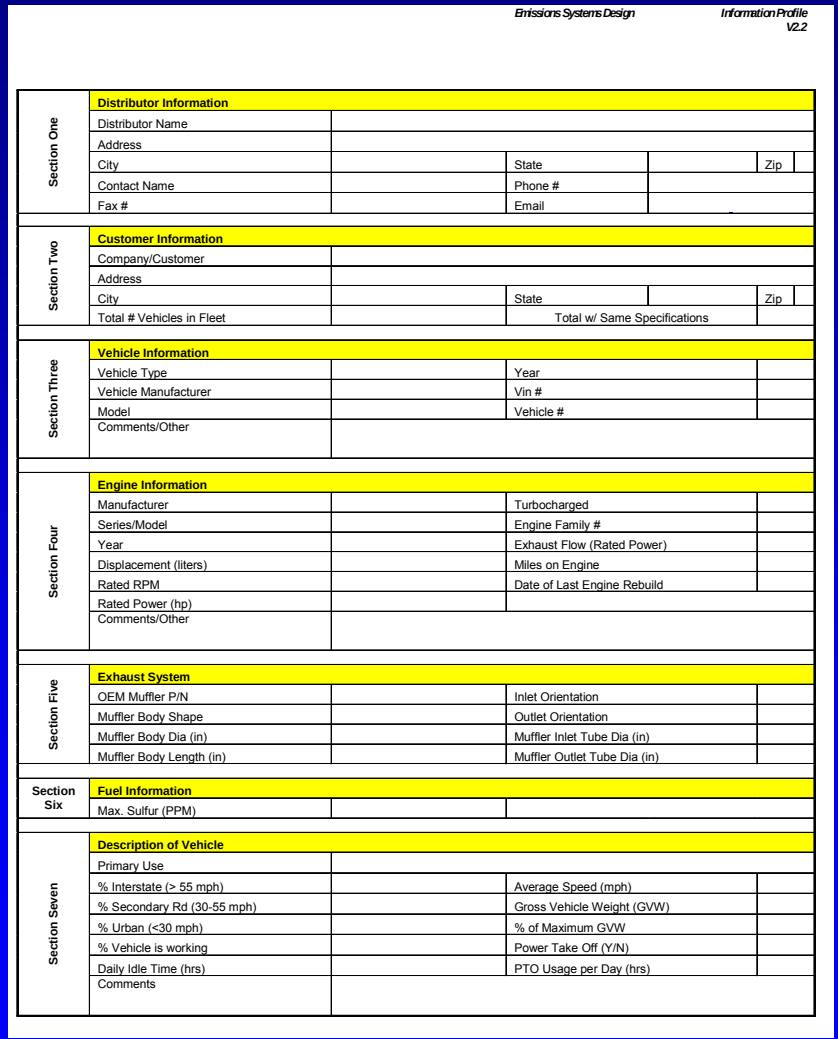
Application Engineering Process

- Opportunity Definition
  - Information profile/documentation
- Control Technology Assessment
  - ARB Verification review
  - BACT review
- Exhaust Temperature/Duty Cycle Assessment
  - Datalogging
  - Analysis/Feedback
- Control Technology Sales/Application
  - Product selection/supply
  - Installation/maintenance

Opportunity Definition

- Information Profile/Documentation
- Fleet Analysis
  - Engine/Vehicle/Make/Model/Year
  - Engine Type/Configuration
  - Exhaust System Details
  - Mounting Hardware



Emissions Systems Design — *Information Profile V2.2*

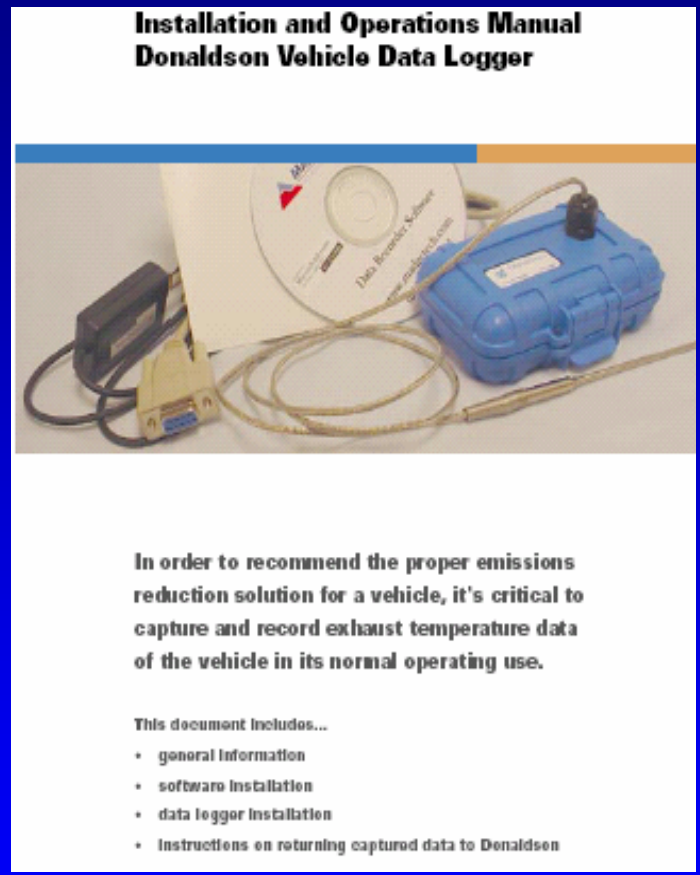
Section One	**Distributor Information**				
	Distributor Name				
	Address				
	City		State		Zip
	Contact Name		Phone #		
	Fax #		Email		
Section Two	**Customer Information**				
	Company/Customer				
	Address				
	City		State		Zip
	Total # Vehicles in Fleet		Total w/ Same Specifications		
Section Three	**Vehicle Information**				
	Vehicle Type		Year		
	Vehicle Manufacturer		Vin #		
	Model		Vehicle #		
	Comments/Other				
Section Four	**Engine Information**				
	Manufacturer		Turbocharged		
	Series/Model		Engine Family #		
	Year		Exhaust Flow (Rated Power)		
	Displacement (liters)		Miles on Engine		
	Rated RPM		Date of Last Engine Rebuild		
	Rated Power (hp)				
	Comments/Other				
Section Five	**Exhaust System**				
	OEM Muffler P/N		Inlet Orientation		
	Muffler Body Shape		Outlet Orientation		
	Muffler Body Dia (in)		Muffler Inlet Tube Dia (in)		
	Muffler Body Length (in)		Muffler Outlet Tube Dia (in)		
Section Six	**Fuel Information**				
	Max. Sulfur (PPM)				
Section Seven	**Description of Vehicle**				
	Primary Use				
	% Interstate (> 55 mph)		Average Speed (mph)		
	% Secondary Rd (30-55 mph)		Gross Vehicle Weight (GVW)		
	% Urban (<30 mph)		% of Maximum GVW		
	% Vehicle is working		Power Take Off (Y/N)		
	Daily Idle Time (hrs)		PTO Usage per Day (hrs)		
	Comments				

Control Technology Assessment

- ARB Verification Listing Review
  (www.arb.ca.gov/diesel/verdev/verdev.htm)
  - Level 1 Verified Technologies (≥ 25% PM reduction
  - Level 2 Verified Technologies (≥ 50% PM reduction)
  - Level 3 Verified Technologies (≥ 85% PM reduction)
- Best available Control Technology (BACT) Review
  - Select highest level PM reduction technology available (Level 3, 2, or 1) which is verified/approved for specific engine families and operating conditions
- Assess Exhaust Temperature/Duty Cycle Requirements
  - Match of control technology level to engine/vehicle operation
  - Determine exhaust temperature/duty cycle datalogging need

Exhaust Temperature/Duty Cycle Assessment

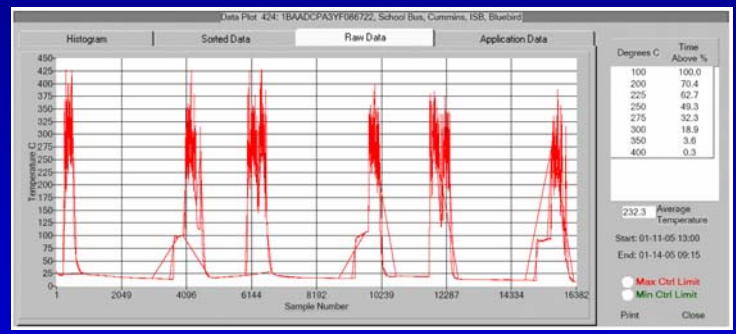
- Provide Datalogging Capability
  - Datalogger Kit
    - Hardware
    - Installation/operations manual
    - Software
    - Instructions/Data form
- Complete Datalogging
  - Data taken and provided to control technology supplier



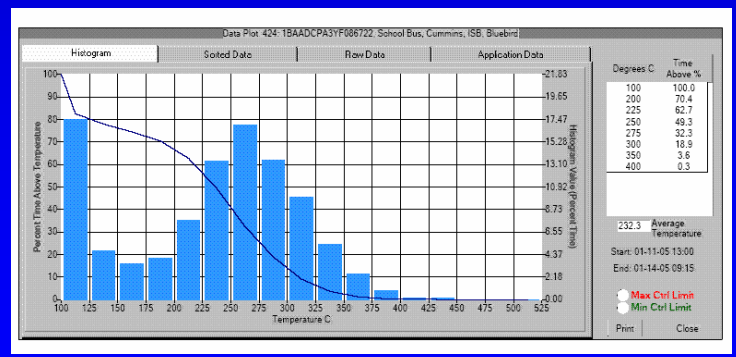
Exhaust Temperature/Duty Cycle Assessment

- Data Analysis
  - Data imported into supplier database for analysis and storage
  - Analysis/assessment for proper temperature criteria
- Feedback Response Documented to Customer

Raw Temperature Data

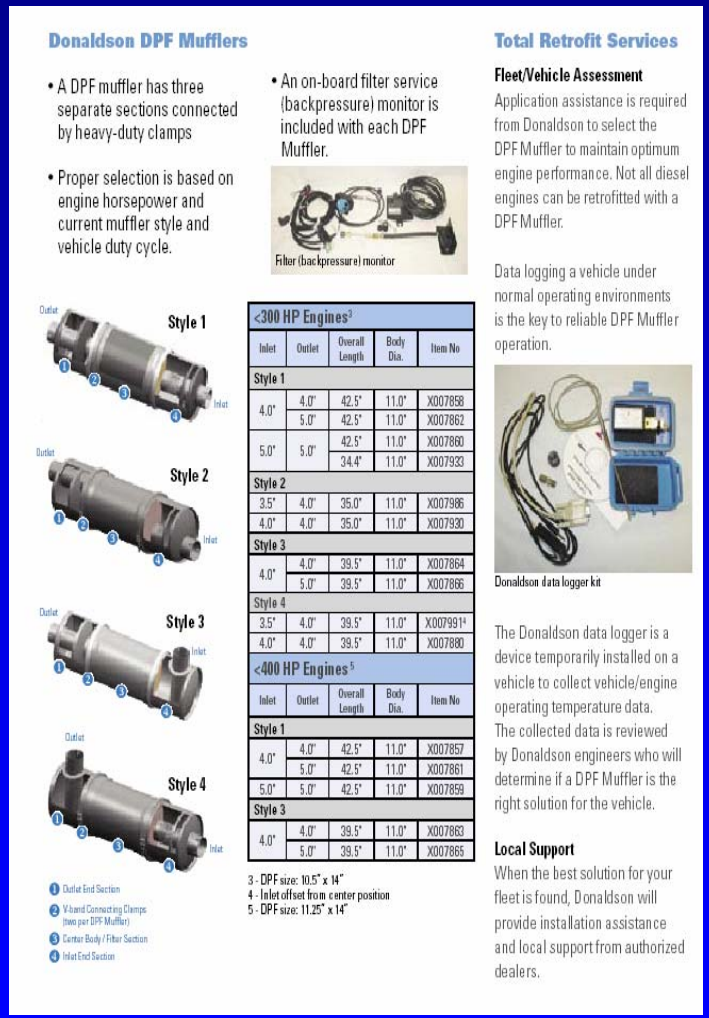


Temperature Plot



Control Technology Sales/Application

- Product Selection/Supply
  - Sales/Application Literature



Donaldson DPF Mufflers

- A DPF muffler has three separate sections connected by heavy-duty clamps
- Proper selection is based on engine horsepower and current muffler style and vehicle duty cycle.
- An on-board filter service (backpressure) monitor is included with each DPF Muffler.

Filter (backpressure) monitor

Style 1

Style 2

Style 3

Style 4

1 Outlet End Section
2 V-band Connecting Clamps (two per DPF Muffler)
3 Center Body / Filter Section
4 Inlet End Section

<300 HP Engines[3]				
Inlet	Outlet	Overall Length	Body Dia.	Item No
Style 1				
4.0"	4.0"	42.5"	11.0"	X007858
	5.0"	42.5"	11.0"	X007862
5.0"	5.0"	42.5"	11.0"	X007860
		34.4"	11.0"	X007923
Style 2				
3.5"	4.0"	35.0"	11.0"	X007986
4.0"	4.0"	35.0"	11.0"	X007930
Style 3				
4.0"	4.0"	39.5"	11.0"	X007864
	5.0"	39.5"	11.0"	X007866
Style 4				
3.5"	4.0"	39.5"	11.0"	X007991[4]
4.0"	4.0"	39.5"	11.0"	X007880
<400 HP Engines[5]				
Inlet	Outlet	Overall Length	Body Dia.	Item No
Style 1				
4.0"	4.0"	42.5"	11.0"	X007857
	5.0"	42.5"	11.0"	X007861
5.0"	5.0"	42.5"	11.0"	X007859
Style 3				
4.0"	4.0"	39.5"	11.0"	X007863
	5.0"	39.5"	11.0"	X007865

3 - DPF size: 10.5" x 14"
4 - Inlet offset from center position
5 - DPF size: 11.25" x 14"

Total Retrofit Services

Fleet/Vehicle Assessment

Application assistance is required from Donaldson to select the DPF Muffler to maintain optimum engine performance. Not all diesel engines can be retrofitted with a DPF Muffler.

Data logging a vehicle under normal operating environments is the key to reliable DPF Muffler operation.

Donaldson data logger kit

The Donaldson data logger is a device temporarily installed on a vehicle to collect vehicle/engine operating temperature data. The collected data is reviewed by Donaldson engineers who will determine if a DPF Muffler is the right solution for the vehicle.

Local Support

When the best solution for your fleet is found, Donaldson will provide installation assistance and local support from authorized dealers.

Control Technology Sales/Application

- Installation/Maintenance
  - Owner's Manual
    - Installation, warranty and maintenance procedures
- Application Documentation Files
  - Specific control technology match to engine/vehicle application