



Verified Emission Control Products

# **An Innovative & Integrated Safe DPF cleaning process**

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Today's Leading Technology for Tomorrow's Future

## **Outline**

- **Background**
- **Concept Design**
- **Prototype**
- **Testing data**

## Background

- Beside the growing DPF retrofit opportunities, 2007 On-Road and emerging Off-Road regulation have widely increased the utilization of DPF on 2007 year model vehicles and beyond. 1<sup>st</sup> wave of OEM production fitted with DPF will require a 1<sup>st</sup> cleaning or ash removal process by the end of 2008 or early 2009.
- Many studies concluded the impact of lube ash accumulation on DPF capacity and integrity under exothermic conditions.
- An End-User with multi vehicle makes require single method and process to clean various DPF configurations
- The cleaning process needs to be consistent & comprehensive;
  - Able to quantify DPF loading
  - Safeguard mechanical integrity of the DPF
  - Able to quantify cleaning efficiency



## Background: DPF Cleaning Methods

Method	Type	Effect
Thermal	Electrical Heater	Effective on Soot No effect on Ash
Compressed Air	Back Flush	Limited effect on loose Soot & Ash
	Pulse	Better effect on loose Soot & Ash
	Vacuum	Improve compressed air method effectiveness
Wet	Water Flush	Limited use with non water soluble catalyst Impact mat durability
	Steam Flush	Limited use with non water soluble catalyst Impact mat durability



## Concept Design : Criteria

### Design Criteria: DPF cleaning process:

- Easy
- Practical
- Consistent
- Safe
- Measurable
- Environmental-friendly



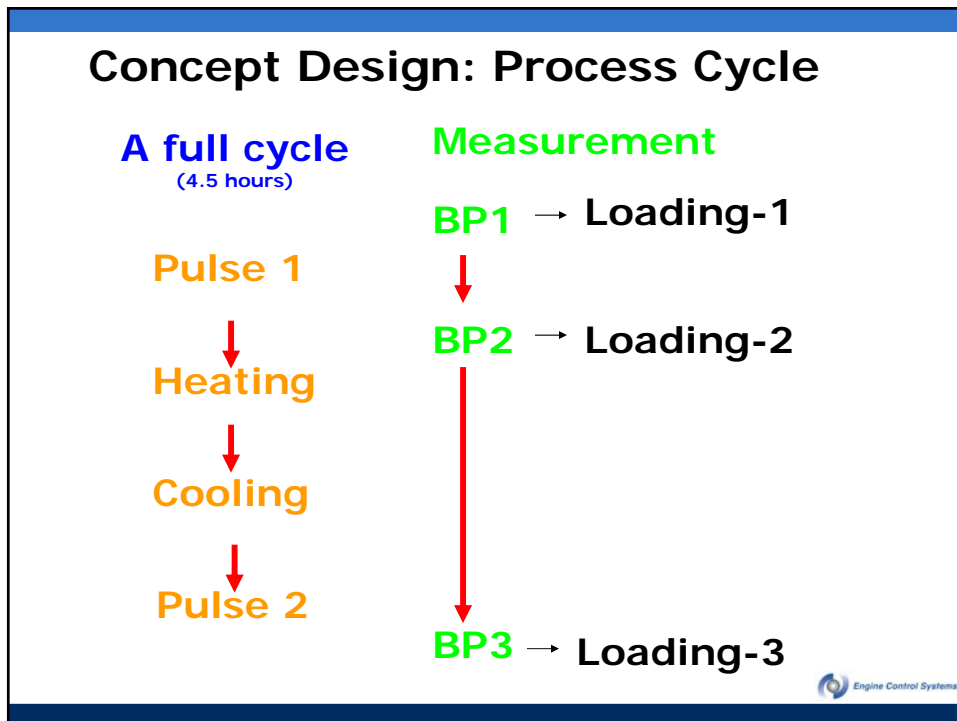
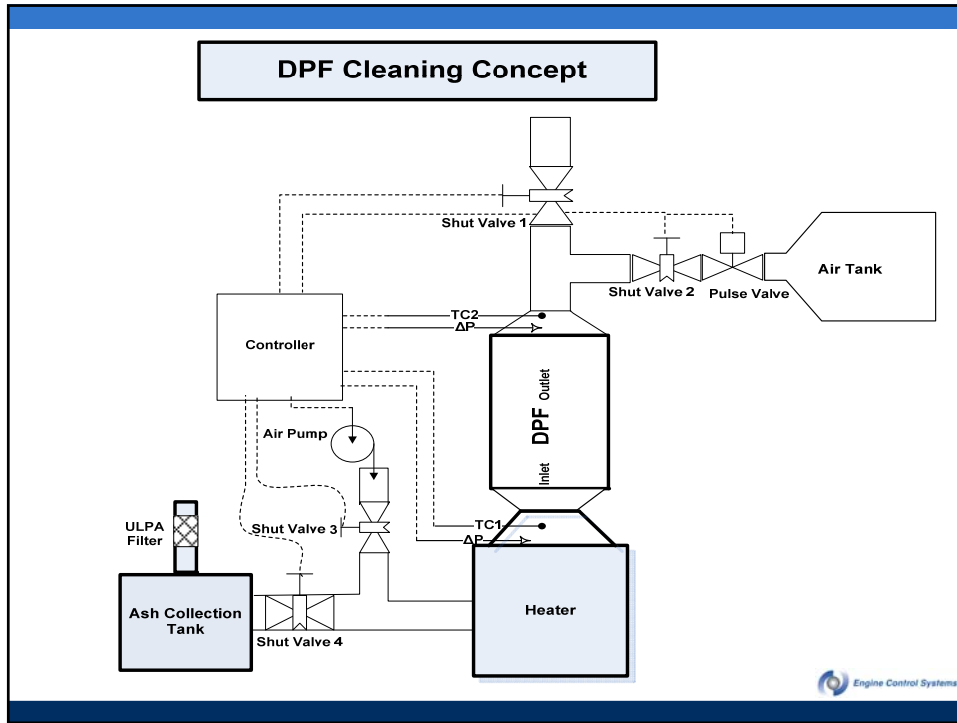
## Concept Design: The Solution Concept

### An innovative concept

Best cleaning method: Integrate heating, air pulsing and flow test bench into one machine, which is;

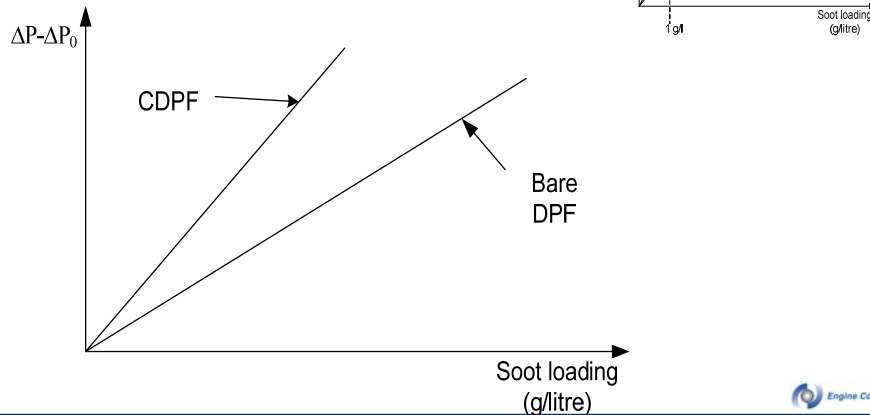
- ✓ Economical, durable, reliable and environmental-friendly
- ✓ Provide highest soot & ash removal efficiency
- ✓ Universal and able to adapt different DPF configurations
- ✓ Fully automatic with built-in self-diagnosis
- ✓ Able to quantify cleaning effectiveness





## Concept Design: Fundamentals

$$\Delta P_{loaded} = \Delta P_0 + Q \cdot M \cdot K$$



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## Concept Design: DPF Condition Assessment

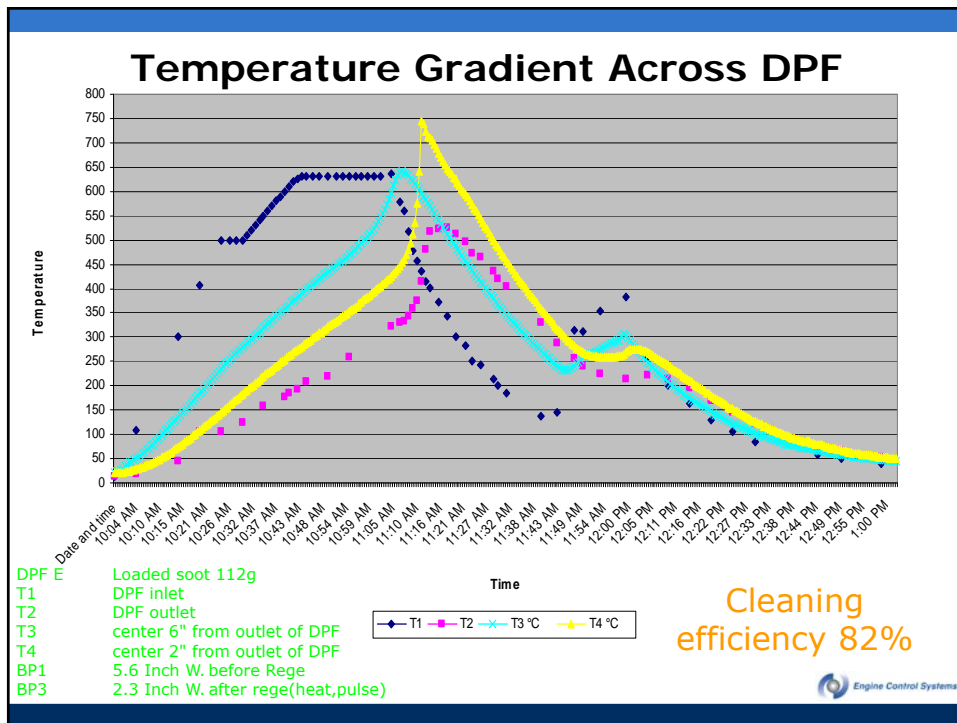
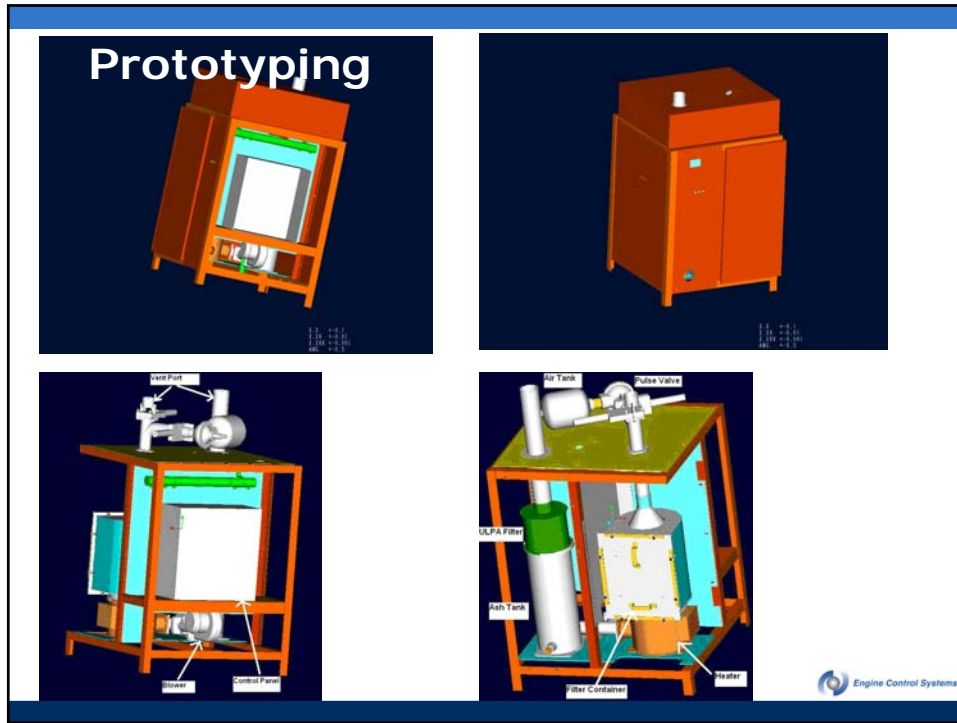
$$\text{cleaning efficiency} = \frac{\text{loading}_1 - \text{loading}_2}{\text{loading}_1} \times 100\%$$

✓ differential pressure  $\Delta P$  is critical parameter for both initial assessment of DPF soot loading and assessment of cleaning efficiency

✓  $\Delta P$  is function of accumulated soot and ash loading mixture

✓ the significant drop of differential pressure will reflect loading reduction after cleaning, which is correlated to weight change of DPF after cleaning experimentally

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## Conclusion

1. An innovative and comprehensive process is developed for DPF cleaning.
2. The process can work with both soot loaded and ash loaded DPF.
3. A prototype was built based on conceptual design
4. The prototype machine was validated using real-life DPF and the cleaning efficiency was quantified.
5. The cleaning machine is universal and can be used for both OEM and retrofit DPF product.



# Thank You!

