Technology for a cleaner world.

-- December 15, 2006 --

Presentation to City of Long Beach

Forward Looking Statements

This presentation contains forward-looking statements that involve risks and uncertainties. The forward-looking statements contained herein represent the judgment of Rotec as of the date of this presentation. These forward looking statements are not guarantees of future performance. Actual results could differ materially from those currently anticipated to due to a number of factors.

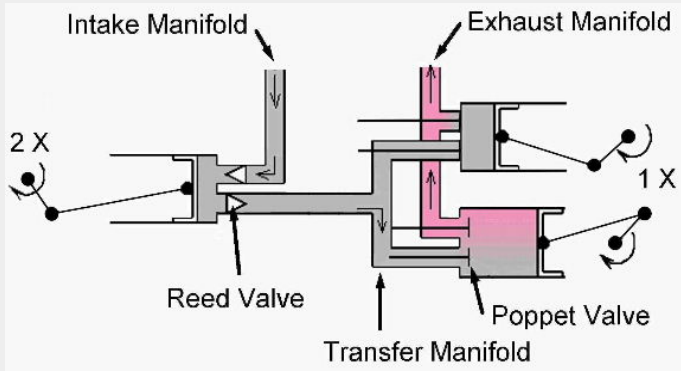
Rotec's Technology – HDV application

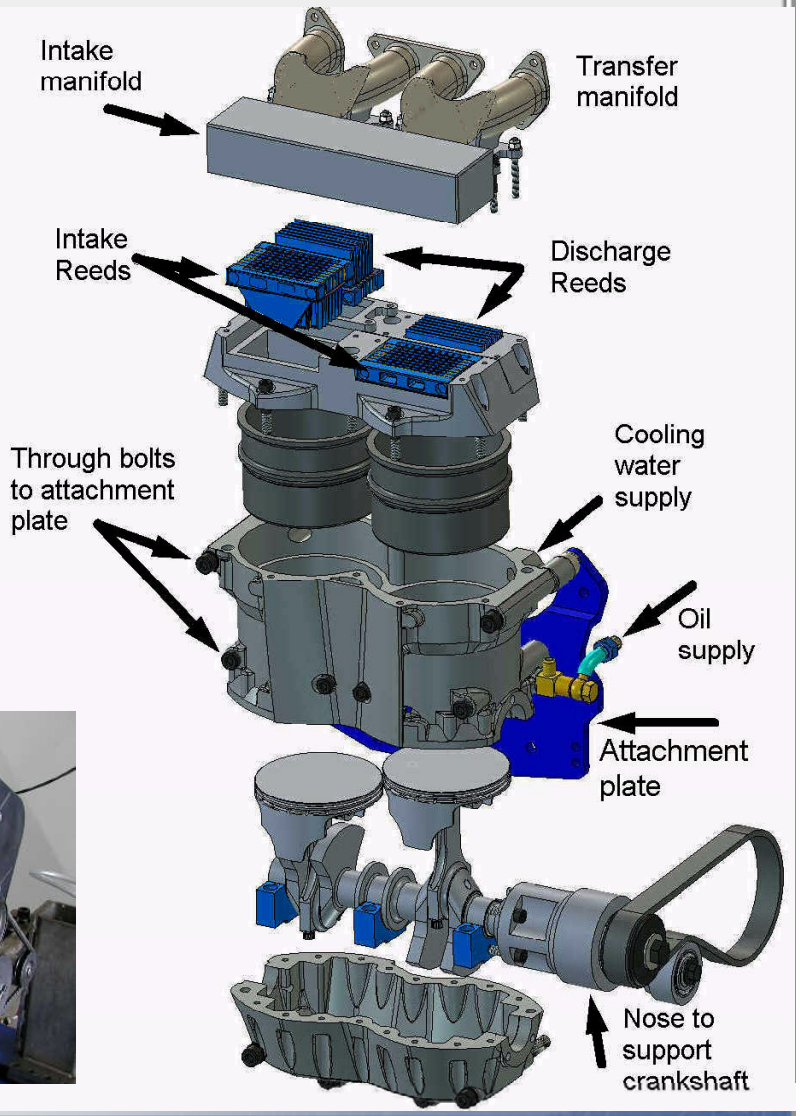
- Suitable for older, high PM, low temp engines
- Simultaneously reduces PM, NOx, HC, CO
- Offers the lowest capital and operating cost per ton of pollutant removed
- Is not temperature or duty-cycle dependent
- Requires no dosing system (fuel or additive)
- Requires no ash disposal or maintenance (other than yearly drive belt change)
- Durable for engine life & does not reduce engine life
- Tamperproof – engine won't run if disconnected

- No increase in NO_2/NO ratio (now regulated by CARB)
- No “plug-in regeneration” needed (like active filters)
- Small increase in engine efficiency and fuel economy at higher loads
- No exhaust backpressure increase so has no adverse effect on engine power or drivability
- Mechanical simplicity, reliability & durability
- Reduces ultra-fine particulates as well as larger visible PM – filters thought to substantially increase ultra-fines
- Not sensitive to fuel sulfur level
- Backed by a national parts distribution network

Technology Overview

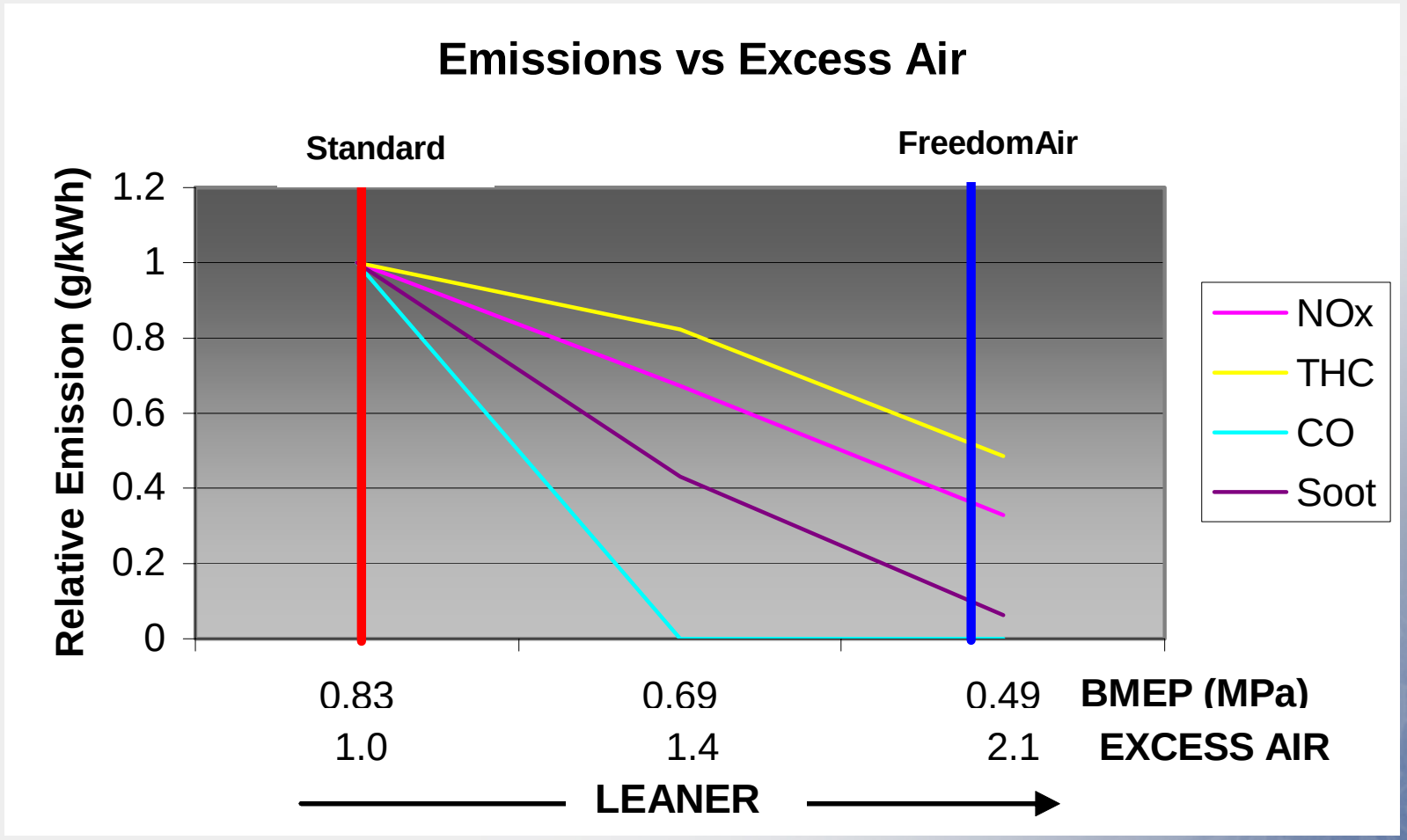
- Mechanical air delivery system that uses a reciprocating piston pump to “pulse” a diesel engine cylinder with fresh air on every piston upstroke

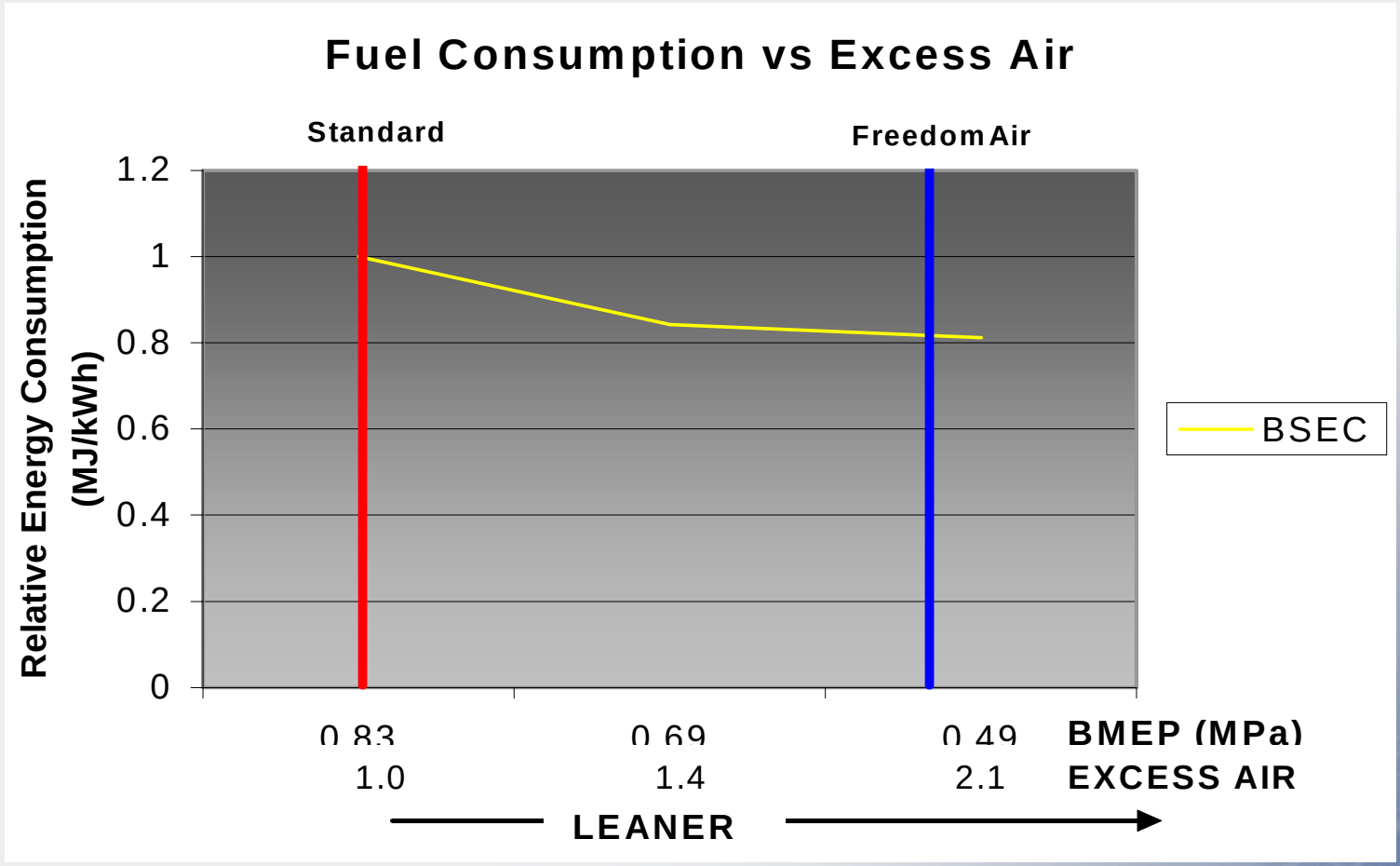




How the Technology Works

- Mechanism for clean air to be injected into the cylinder and exhaust air to be expelled simultaneously
- This means every piston upstroke generates power, doubling the number of combustion events
- The amount of fuel is now spread across two piston strokes rather than one with no power loss
- This process doubles the air to fuel ratio in the engine which can either be used to simultaneously reduce PM, NOx and other pollutants, increase power, or a combination of both.

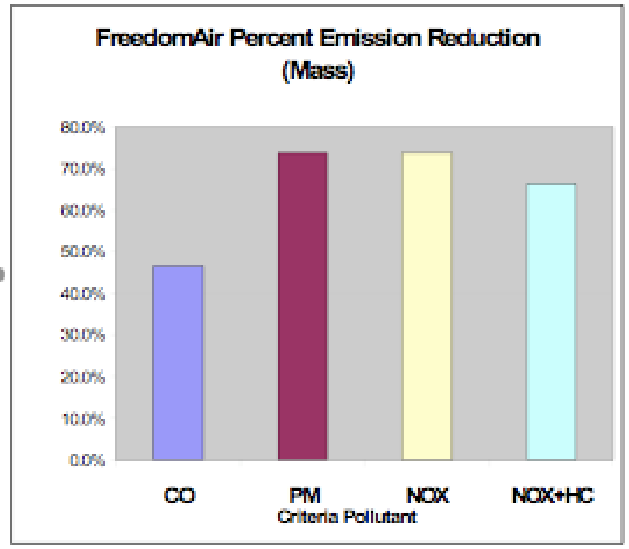

Emissions vs Excess Air
Standard
FreedomAir
Relative Emission (g/kWh)
1.2
1
0.8
0.6
0.4
0.2
0
NOx
THC
CO
Soot
0.83
1.0
0.69
1.4
0.49
2.1
BMEP (MPa)
EXCESS AIR
LEANER


Fuel Consumption vs Excess Air
Standard
Freedom Air
Relative Energy Consumption (MJ/kWh)
1.2
1
0.8
0.6
0.4
0.2
0
BSEC
0.83
0.69
0.49
BMEP (MPa)
1.0
1.4
2.1
EXCESS AIR
LEANER

SUMMARY

LOAD POINT				% REDUCTION BY MASS												WEIGHTED
SPEED	TORQUE	WEIGHTING	TIMING	CO			PM			NOX			HC			NOX+HC
				ppm		mass	mg/m^3		mass	ppm		mass	% conc.		mass	
				before	after		before	after		before	after		before	after		
2000	35	20%	2.5	431	353	46.8%	133	41	76.2%	220	51	73.8%	0.12	0.05	22.0%	68.2%
1750	120	20%	2.5	1067	320	36.4%	330	86	79.6%	547	84	67.3%	0.34	0.10	55.9%	66.1%
1500	60	35%	2.5	449	174	47.0%	104	36	67.0%	285	54	75.0%	0.10	0.10	-50.0%	61.6%
900	IDLE	25%	4.5	251	79	57.0%	42	11	82.0%	613	65	79.0%	0.10	0.03	60.0%	77.0%
WEIGHTED TOTAL REDUCTIONS						**47.3%**			**75.1%**			**74.2%**			**13.1%**	**67.7%**

Load point weightings and NOx/HC ratio weighting reflect Euro drive cycle for medium gvm car



External Validation

- Independent verification of the Rotec technology emission reductions, ability to increase power, and mechanical durability (Gilmore Engineers)
- Texas Emerging Technology Fund award of $1m
- Innovative Clean Air Technologies (ICAT) Program grant ($225k) to demonstrate heavy-duty diesel engine emission reductions
- Prof. John Johnson report per CARB request

How We Can Help the SPBP CAAP

- Heavy-duty vehicle retrofit:
  - Initially target older, high PM, low-temp applications i.e. where passive PM filters not effective
  - Expect Level 3 PM reduction with >50% NOx reduction
  - Around $7,500 per unit capital cost (HHD 6 cyl)
  - Only maintenance is belt replacement ($100/yr)
- How and When:
  - Installation by vendor facility (2 days), or by kit (offsite)
  - First engine family verified by CARB in 12 months
  - 2 new families per year over 3 years covering 90% of HDV fleet

Contribution to CAAP Emission Goals

- Scenario 1 – REDD/FreedomAir fitted to 94% of 1983 to 1993 frequent and semi-frequent callers
- Scenario 2 – PLUS replace pre-1983 trucks with 2007-2010 MY trucks
- Scenario 3 – PLUS fit passive filters to post 1993 trucks

	PM	**NOx**
HDV business as usual	100%	100%
Scenario 1 – REDD only	53%	33%
Scenario 2 – add truck replacement	60%	40%
Additional benefit of Scenario 2	*7%*	*7%*
Scenario 3 – add passive filters	65%	40%
Additional benefit of Scenario 3	5%	0%

Implementation Strategies

- 80% of port visits made by 16,800 frequent & semi-frequent callers
- 65% of this group span the 1983-1993 period making 74% of the HDV NOx and 83% of the HDV PM
- 90% in 5 engine family groups

2006/07	*2007/08*	*2008/09*	*2009/10*	*2010/11*	Total
0	300	1650	4200	4230	10380
0%	3%	16%	40%	41%	100%

Implementation Strategies

- Install at dedicated facility located close to port, and if needed some outsourcing in kit form
- To make early progress, focus on post-1993 engines with passive DPF's in yr1 and buy out some pre-1983 trucks
- Any lagtimes or delays could be made up by both fitting DPFs and new purchases in yr 2 on
- Possible incentive is to pay for/loan some/all of engine re-manufacture cost co-incidental with fitment of REDD ($4 to $7 thousand)

Where is Rotec in the process? What timelines?

- CARB verification needed for Port to claim emission credits – four steps:
  - Produce retrofit kits for Detroit 60 Series (popular engine in port trucks) – 7 months
  - Emission testing by CARB approved lab – 1 month
  - In-service demonstration (port trucks) – 3 months
  - 2nd test of same engines – 1 month

Estimated Budget Requirements

Cost Assumptions	
Unit cost of REDD	$7,500
Installation	$800
New truck cost	$129,500
Passive filter cost inc. installation	$8,500

Cost per Scenario		Total for Combined
Scenario 1 REDD	$86,154,000	$86,154,000
Scenario 2 increase - add truck replacement	$108,780,000	$194,934,000
Scenario 3 increase - add filters	$39,984,000	$234,918,000

Cost Benefit Comparison	$m per % Point Pollution Reduction	
	PM	NOx
REDD	$162	$258
Truck Replacement	$1,477	$1,695
Passive Filter	$852	n/a

Estimated Budget Requirements

- Carl Moyer may contribute other than through SCAQMD depending on ARB regulations at the time

How We Can Help the SPBP CAAP

- Ocean Going Vessels - auxiliary engines retrofit:
  - Where shore-power solutions not cost-effective
  - Similar benefits to HDV engines (scaling factors OK)
  - Requires engineering and feasibility study
    - Space claim, engine family spread?
    - Installation – during transit by vendor team?
    - Effect of fuel density?
    - Benefits travel with vessel?
    - Finance options?

Benefit Summary

- Can retrofit older as well as newer HDVs
- Substantially contribute to both PM and NOx targets
- Funding saved can be redirected to other/new programs (opportunity cost)
- Potential for OGV auxiliary retrofit where other solutions not available

Going Forward

- Demonstration program with HDVs
- Feasibility analysis for OGV auxiliaries
- MOU for HDV fitment – contingent on demo program outcomes
- Support with government agencies – finding the right people
- Overall benefit is to SPBPs and its stakeholders corporate reputation – right outcomes at lowest cost

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