



Retrofitting LPG Forklifts to Reduce Emissions

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About Emisstar LLC

- Environmental Consulting
- Mobile Emissions Reductions
- TERP Experience
- Control Technology Experience

- “Mobile Emissions Technology, Policy and Implementation”

Technology – Retrofit for LPG Forklifts

- 83% Reduction in NOx
 - From 12 grams to 1 gram / bhp-hr
 - Most used forklifts 12 gram emitters
- CARB Verified, TERP Eligible
- Funded by NTRD
- 3-way catalyst, muffler replacement
- TermiNOx, Made by Engine Control Systems (ECS)

Implementation – Used LPG Forklifts

- 36,000 LPG forklifts in TERP Areas (RRC)
- 70% are pre-2004 model year
- ~8,000 in Houston-Galveston area
- Potential 3 tpd NO_x reduction:
 - 50% retrofitted
 - $= (8,000(.50)(.3 \text{ tons/yr.}))/365 \text{ days/yr}$



Additional Emissions Benefits

- Fuel Savings of 10-20%
- CO₂ Reduced 1 - 3 tons/yr per forklift
 - 1 acre trees = 3 tons/yr
- CO, HC reduced 85% or more
- Public Health Plus
 - LPG Forklifts frequently used indoors

Implementation – Why Used LPG Forklifts?

- They last 15 – 20 years
- Price Conscious Market
 - Tier 2, 3, 4 buyers
 - Does not impinge on new forklift market
 - Moderate \$\$\$ will incentivize
- Unaddressed Opportunity
 - RRC has done 500 grants
 - “Low Hanging Fruit”

Retrofits Not Popular in TERP

- No mandatory emissions standards
- Grant does not cover equipment downtime
- TERP grants: 6-9 months to reimburse
- Dealers prefer to sell equipment

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- Equipment owner does not perceive value



Policy – Proposal to TCEQ

- Dealer installs retrofit pre-sale.
- Allow buyer of retrofitted forklift to apply for replacement grant.
- RRC agreed to administer.

Proposal to TCEQ - Details

- Dealer installs pre-sale
 - Retrofits used forklifts coming off lease
 - Incentive – Grant availability is a sales tool
 - Incentive – Profit on sale and service
- Buyer of retrofitted, used forklift
 - Exceeds TERP 25% criteria
 - Scraps old forklift
 - Incentive – Grant reduces price of cleaner equipment

Examples – 55 hp LPG Forklift

Activity Life	Hours Used	Invoice Price	Grant to Buyer	Cost to Buyer	Cost Per Ton	Reduced Total Tons	Annual Tons
5 yrs.	1658	\$18,000	\$7945	\$10,054	\$5,000	1.6	0.3
5 yrs.	1000	\$16,500	\$4792	\$11,708	\$5,000	1.0	0.2

New Forklift Prices, with Grants: \$13,000 - \$21,000

Policy – However...

- Although TCEQ has ability to implement,
- *Do not need Commissioners' OK*
- Not agreeable so far...why?
 - “Concern over setting a precedent”
 - Other concerns?

Support Requested

- Letters of support from H-GAC, Members
 - Will add “oomph” to position
- Consider local action
 - Locally sponsored grants
 - Combination grants – TERP + local funds
 - “Instant Rebates”
- Interested in your innovative funding ideas.

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