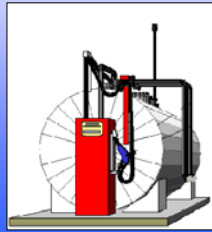


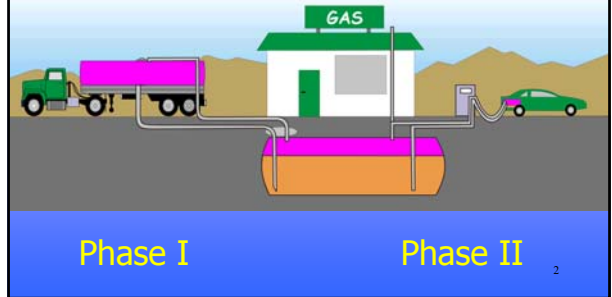
April 24, 2003

Stage 1 and Stage 2 Vapor Recovery

Clean Fuels and Vehicles Workshop
Hanoi, Vietnam
May 14, 2004



Vapor Recovery Overview



Stage 2 Vapor Recovery

- Balance System Versus Vacuum Assist
- Maintenance is Critical
- Alternative is Onboard Vapor Recovery
 - Only \$6-8 per Vehicle
 - Fuel Savings Will Quickly Pay For It

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Gasoline Vapor Recovery System

• Stage I at Bulk Terminal, Tank Trucks, and Service Stations

- Effective immediately for new facilities in Bangkok, Nonthaburi, Pratum Thani, and Samut Prakarn
- Used to be scheduled to be effective on January 1, 2000 for existing facilities located in Bangkok, Nonthaburi, Pratum Thani, and Samut Prakarn, however, due to economic crisis, it is postponed to January 2001
- Volatile organic compound emissions of Stage I at bulk terminals must not be more than 17 mg/m³ of vapor vented which is equivalent to 10 mg/liter of gasoline loaded
- Implementation in other provinces will be considered in the future

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Gasoline Vapor Recovery System

Stage II at Service Stations

- Effective immediately for new and existing service stations located on the side of the streets having the width between 8 to 12 meters or located in the building in Bangkok, Nonthaburi, Pratum Thani, and Samut Prakan
- Implementation in other service stations and in other provinces will be considered in the future

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Stage II Vapor Recovery System at Service Station



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Emission Standard for Gasoline Vapor Recover Unit (VRU)

Pollutants	Emission Standard Value	Method
	(1-hr average)	
Total VOCs	58 Milligram total VOCs/Liter in Emitted Vapor (First Year)	US.EPA Method 18 : Measurement of Gaseous Organic Compound Emission by Gas Chromatography
	17 Milligram total VOCs/Liter in Emitted Vapor (After First Year)	US.EPA Method 25A : Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer or US.EPA Method 25B : Determination of Total Gaseous Organic Concentration Using a Nondispersive Infrared Analyzer

Remark: Reference condition is 25 °C at 1 atm or 760 mmHg Excess Air of 50% or at Oxygen of 7% and Dry Basis

Source : Notification of Ministry of Science, Technology and Environment published in the Royal Government Gazette, Vol.118 Special Part 58D, date June 20, B.E. 2544 (2001)