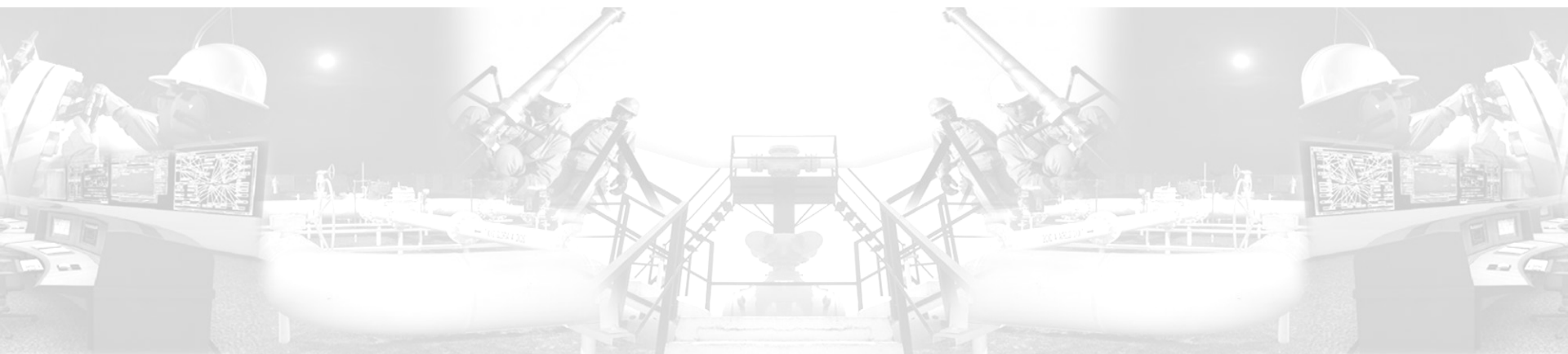
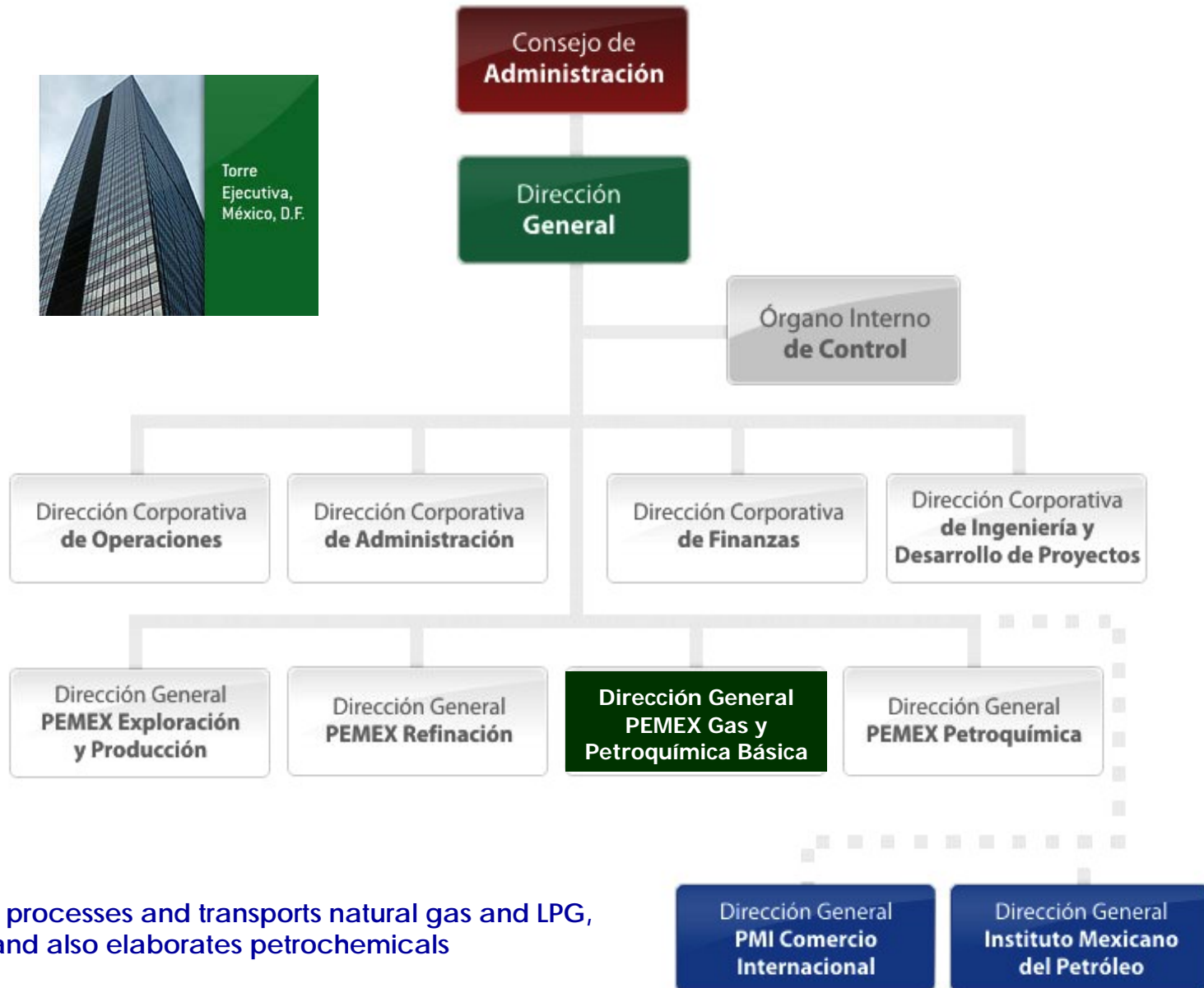


Detection and Assessment of fugitive emissions of volatile organic compounds in the Pemex Gas Transportation Pipeline System.



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Pemex Gas processes and transports natural gas and LPG, and also elaborates petrochemicals



Polity



PEMEX Gas adopted the commitment of environment protection for the community's benefit.

Objective:

To evaluate and eliminate the fugitive emissions of volatile organic compounds in the Pemex Gas' transportation pipeline system.

Goals:

- ✓ To reduce the environmental impact by reducing methane emissions in the Pemex Gas transportation system.
- ✓ To reduce risks to environment, employees and nearby communities
- ✓ To capture economic benefits
- ✓ To preserve the image of the company before the community.

Febrero, 2006

National framework:

- ✓ NOM-009-SECRE-2002 Monitoring, detection and classification of natural gas and LPG leaks
- ✓ NOM-007-SECRE-1999 Natural Gas Transportation.
- ✓ NOM-003-SECRE-2002 Natural and LPG Transportation Pipelines.

International methodologies and rules:

- ✓ Metod 21, EPA Determination of Volatile Organic Compounds Leaks
- ✓ Rule 1173 Fugitive Emissions of Volatile Organic Compounds
- ✓ 49 FR 23513 National Emission Standard for Equipment Leaks (Fugitive Emission Sources), Subpart V
- ✓ ASME Gas Leakage Control Criteria. Appendix M
- ✓ AP-42 Section 7, Factor Emissions
- ✓ CAAA Clean Air Act Amendment of 1990
- ✓ SARA, Titulo III Superfund Amendment and Reauthorization Act
- ✓ NSPS New Source Performance Standards
- ✓ NESHAP National Emission Standards for Hazardous Air Pollutants

1. Inventory of the equipment and components in the on-ground facilities.
2. Identification and labeling.
3. Fugitive emissions monitoring.
4. Data base
5. Data validation
6. Classification of components with detected fugitive emissions
7. Statistical analysis and fugitive emissions elimination
8. Verification

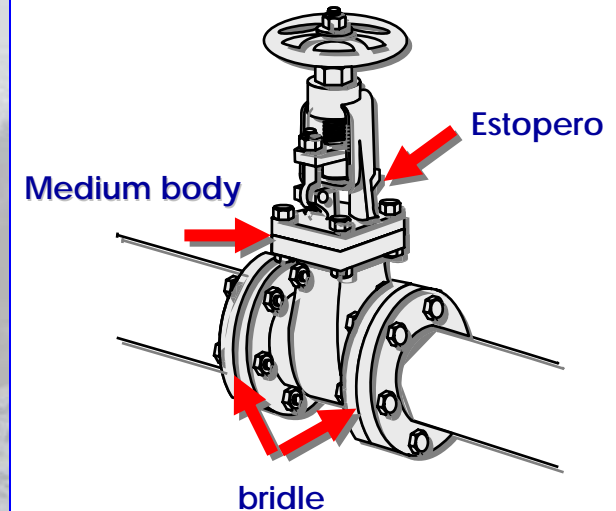
Pemex Gas has applied this methodology to its 14 Pipelines Sectors in the country.

Natural Gas density: 0.6784 Kg/m³
@ 60 °F

Natural Gas Price: 8.03 Dlls/MMBtu

Natural gas Heating Power:

1002 Btu/cf= 998 cf=1 MMBTU =
28.26 m³



Maintenance and Operation Centers	Trap pig	Sectionalizing Block Valves	Regulatory and Metering Stations	Compression Stations	Pumping Stations
Cárdenas	➔ 35	42	15	2	
Nuevo Pemex	➔ 59	53			
Minatitlán	➔ 39	52		1	
Veracruz	➔ 22	40	2	2	
Mendoza	➔ 15	31	9		4
Tlaxcala	➔ 14	36	12		1
Venta de Carpio	➔ 22	39	8		
Salamanca	➔ 24	35	22	1	
Guadalajara	➔ 6	12	1		
Cd. Madero	➔ 9	18	8		
Reynosa	➔ 27	21	4	1	
Monterrey	➔ 25	57	7	2	
Torreon	➔ 23	37	10		
Chihuahua	➔ 32	45	4		
Total	352	518	102	9	5



Pemex Gas has developed a data base containing the information related to these facilities

Operation and maintenance Centers	Sampling (Number of parts)	Number of Parts with fugitive emissions	Kg/year	M3 / year	MM BTU / year	Savings \$P / year
Cárdenas	5546	481	13,895	20,482	725	612,810
Nuevo Pemex	2633	212	5,389	7,947	281	237,790
Minatitlán	6177	537	14,478	21,341	755	638,500
Veracruz	7556	431	12,832	18,915	669	565,920
Mendoza	7091	470	15,129	22,300	789	667,200
Tlaxcala	6198	216	3,659	5,392	190	161,310
Venta de Carpio	5291	274	6,472	9,540	337	285,430
Salamanca	3669	108	2,381	3,509	124	105,010
Guadalajara	2252	109	2,388	3,520	124	105,320
Cd. Madero	3957	121	3,900	5,748	203	171,980
Reynosa	6717	348	8,927	13,160	465	393,720
Monterrey	9361	466	15,951	23,513	832	703,470
Torreon	3550	220	7,331	10,807	382	323,320
Chihuahua	5060	22	801	1181	45	35,340
Total	75,058	4015	113,533	167,355	5,921	5'007,120

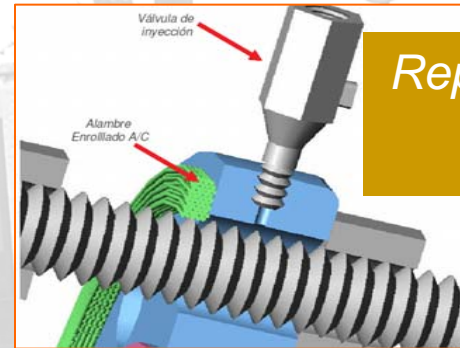
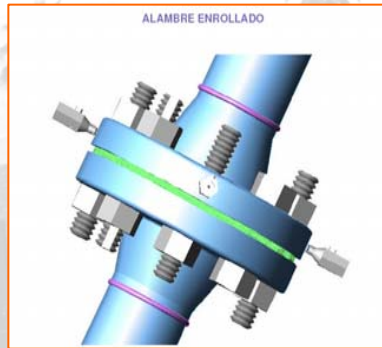
The economic value due to product loss is relatively low, however, eliminating fugitive emissions a potential risk of higher losses is avoided, especially in case of an accident.



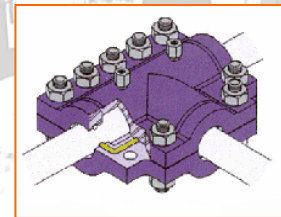
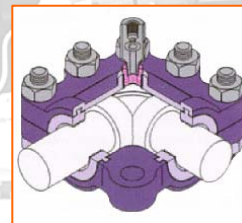
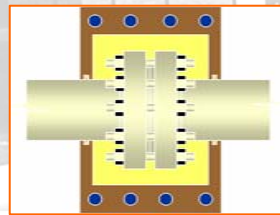
Tightening with Hy-tork Equipment

Execution time:

1- 5 days per installation.



*Repacking in Valve
Parking Box*



Total Encapsulation of Pipeline Accesories: Tee, elbows, flanges, etc.

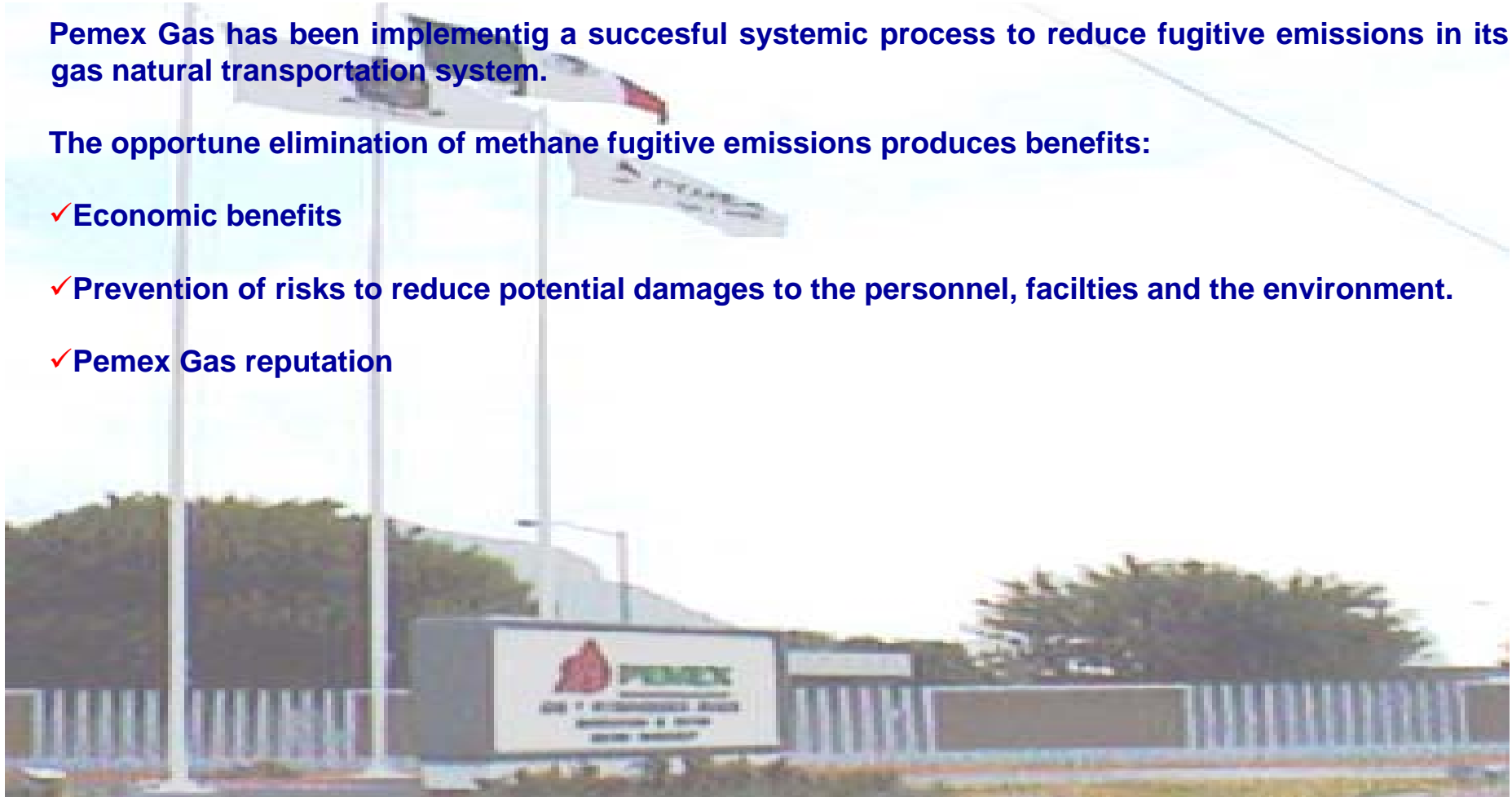


Cost of the corrective maintenance : \$ 1'800,000 Dollar

Pemex Gas has been implementing a successful systemic process to reduce fugitive emissions in its gas natural transportation system.

The opportune elimination of methane fugitive emissions produces benefits:

- ✓ Economic benefits
- ✓ Prevention of risks to reduce potential damages to the personnel, facilities and the environment.
- ✓ Pemex Gas reputation





Thank You



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