INTEGRATED MANAGEMENT FOR THE HANDLING AND DISPOSAL OF SF6 GASES.

RED DE ENERGÍA DEL PERÚ

- REP
- ISA PERÚ
- TRANSMANTARO

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ISA, MULTI LATINA LEADER

- It has 33 subsidiaries; Including REP, CTM and ISA Peru.
- It develops important infrastructure projects that drive the continent's development and progress in Colombia, Brazil, Peru, Chile, Bolivia, Ecuador, Argentina, Panama and Central America.
- It focuses its activities in the business of Electric Energy Transportation, Telecommunication Transport, Road Concessions and Intelligent Management of Real Time Systems.

ISA, A HISTORY WITH FUTURE FACTS …

COMPANY LEADER IN TRANSMISSION OF ELECTRICITY OF PERU

- Red de Energía del Perú S.A. (REP) is a company engaged in the construction and operation of transmission lines high voltage electric power.
- It crosses 21 of the 24 departments
- We operate and maintain about 10,000 kilometers of lines.
- We have a 78% market share in electric transmission services.
- 69 electrical subestations in Perú.

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INVENTORY OF SF6

EQUIPMENT

Measuring transformers

Curcuit Breaker

GIS Cells

NON- EQUIPMENT

SF6 Tanks

	REP			
Columna1	Inventario	Interruptores	Subestaciones encapsulada	Total
Cantidad SF6 (kg)	3,403.70	6,351.68	2,304.00	12,059.38

THE CONVENTIONAL MANAGEMENT OF THE SF6 IN REP

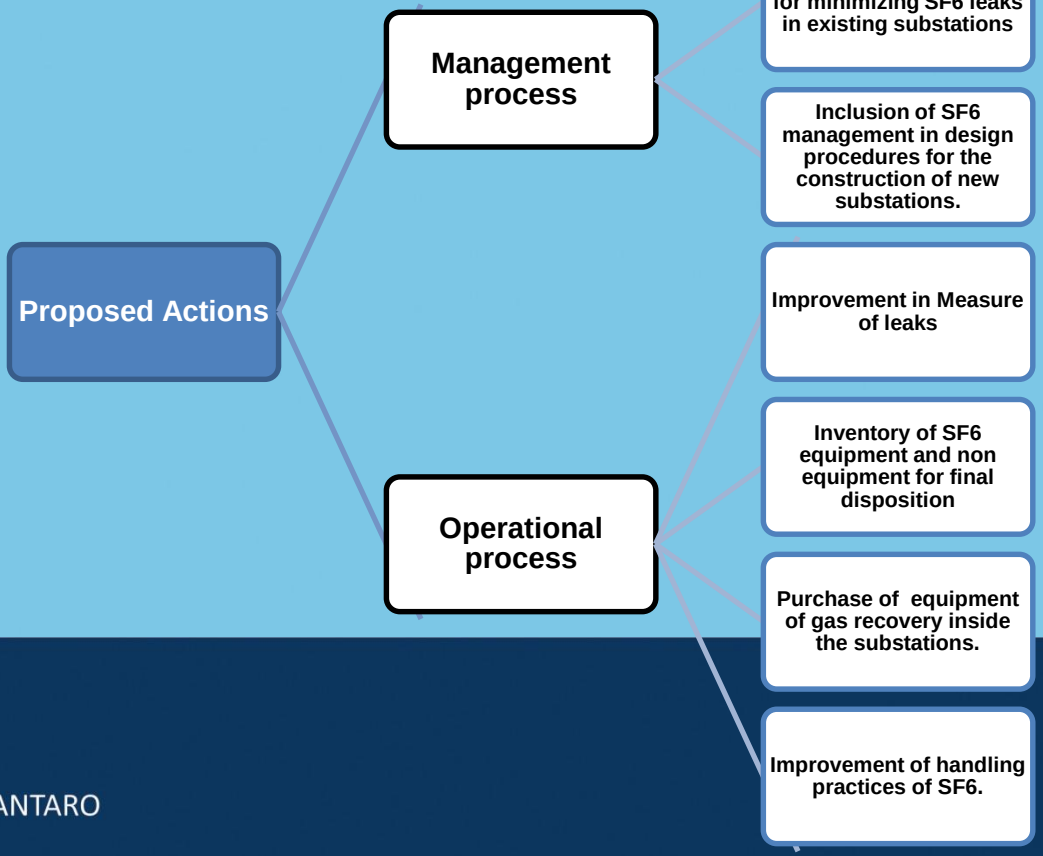
- There is not a complete SF6 Tanks Inventory in quantity and quality terms.
- Leaks are only detected by pressure drops on the manometers.
- There are not corrective actions defined when a leak of SF6 occurs.
- SF6 leaks through bad handling practices during installation, maintenance and dismantling of equipment.
- No disposition of bad quality SF6 tanks.
- SF6 Gas management procedure outdated and without application.

THE CONVENTIONAL MANAGEMENT OF THE SF6 IN REP

- Leaks of SF6 are the second source contributing to the REP Carbon Footprint.
- In the measurement of 2015 – 2016the following results were obtained:

Dpto. Transmisión	SF_6 [Kg]	Emisiones GEI (t CO_2e)
D.T Este	6	141
D.T Norte	19,98	469,53
D.T Centro	0,5	11,7
D.T Sur	8,85	207,98
TOTAL	**35,33**	**830,21**

PROPOSED ACTIONS FOR AN IMPROVEMENT IN SF6 GAS MANAGEMENT



UPDATE OF THE PROCEDURE FOR MINIMIZING SF6 LEAKS IN EXISTING SUBSTATIONS (T-P-17)

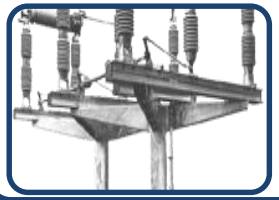
	PROCEDIMIENTO	T-P-17
ISA REP	GESTIÓN PARA MINIMIZAR FUGAS DE GASES SF6 EN EQUIPOS DE PATIO Y BALONES DE ALMACENAMIENTO.	Versión: 01 Fecha: 30.11.2016 Página: 1 de 9

EQUIPMENT

NON- EQUIPMENT

- Purchases
- Reception
- Transport
- Storage
- Disposition

EQUIPMENT WITH SF6



Purchases
According to the environmental and technical specifications of DGM-EPA (Life Cycle of Inputs and Equipment)

Reception
That it complies with the technical specifications.
No corrosion of metal parts (pipes, pressure gauges, valves, etc.).
That it does not present manufacturing defects (flanges, insulators, crankcase, pipes, etc.)

Transport
The load must be ensured and covered correctly**.**

EQUIPMENT WITH SF6

STORAGE

- New and existing equipment must be stored as recommended in manufacturers' manuals.

MAITENANCE

- For the prioritization of preventive maintenance of equipment, in the specific case of SF6 will be considered as critical risk.
- If leaks are detected, the gas must be filled to the equipment at the rated pressure indicated on the data plate, after which the risk-elimination analysis (ECR) will be carried out. The leakage values measured must be entered in the SAP Module.
- All SF6 gas leaks shall be monitored by reporting environmental emergencies and corrective action shall be taken.

FINAL DISPOSITION

- Before the removal of equipment containing SF6, the SF6 gas must be recovered from the switch and placed in a balloon according to established procedures. For this purpose, the gas recovery and treatment equipment

SF6 TANKS

❑**Purchases**

⑩According to the specifications of the specialized technical area

❑**Reception**

❑The visual inspection of the condition of the SF6 gas balls must be carried out. In case of finding a defect in the ball should not be received.

❑**Transport**

❑Transport with chain and upright, MSDS, anti-spill kit, personal protection equipment, etc.

❑It should be taken into account that the transportation of balloons outside the REP / CTM / ISAP facilities will require the authorization of transport of dangerous goods by the Ministry of Transport of Peru

❑, starting at 120 mL, as well as the safety sheet , Safety summary sheet and contingency plan.

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SF6 TANKS

❑**Storage**

❑The SF6 gas ball must be checked for revenue, each ball must be identified in the SF6 Gas Ball Inspection Chart , which must be completed monthly by the yard maintenance manager.

❑Monitoring of the control of SF6 balls must be carried out in the format "Quarterly monitoring of SF6 balls"

❑**Maintenance**

❑The gas of the dismantled equipment must be recovered

❑For recovery and filling, DILO equipment and the manufacturer's supplied kit must be used to avoid environmental leakage

❑**Final Disposition**

❑The final disposal of the equipment must be carried out by a solid waste company complying with national and international legal regulations, the gas may also be donated to recycling centers. The service must be coordinated with the environmental management area, then the database of the specialized technical area.

IMPROVEMENT IN THE MEASURE OF LEAKS: IMPLEMENTATION OF SF6 GAS MONITORING MANOMETERS AT THE GIS PACHACACA SUBSTATION

- In the GIS Pachachaca substation the SF6 gas compartments do not have gauges for the visual monitoring of the gas, every month the operator has to install a portable manometer compartment per compartment for reading and monitoring the SF6 gas pressure.

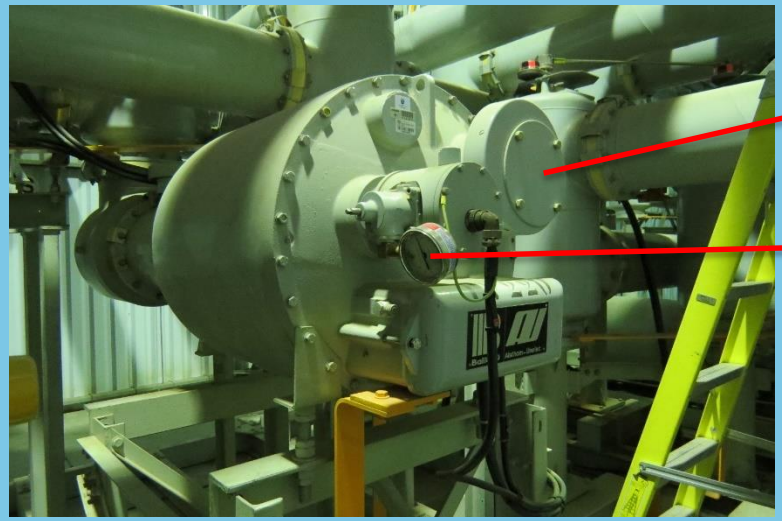
Densitymeter for SF6 gas monitoring (blind).

Requires manometer implementation..

GIS:
Brand: ALSTHOM
Model: FLUOBOCK T105
Rated voltage: 245 kV
Commissioning: 1985

IMPROVEMENT IN THE MEASURE OF LEAKS: IMPLEMENTATION OF SF6 GAS MONITORING MANOMETERS AT THE GIS PACHACHACA SUBSTATION

- Desired situation



Densitymeter

Manometers, it is required to install similar equipment in all compartments

IMPROVEMENT IN THE MEASURE OF LEAKS: IMPLEMENTATION OF SF6 GAS MONITORING MANOMETERS AT THE GIS PACHACHACA SUBSTATION

We will have the following benefits:

- Avoid SF6 gas emissions to the environment in the process of installing and removing the portable manometer performed monthly in 21 compartments of the substation
- Monitoring and early detection of SF6 gas leaks for corrective maintenance. We are currently aware of the leak when the low pressure alarm is emitted by the pressure gauge.

Nominal Pressure	=	3.4 bar relative to 20 ° C
Alarm pressure	=	3.2 bar relative to 20 ° C
Pressure Blocking Trip	=	3.0 bar relative to 20 ° C

- Avoid risk of failure of the return valve of the behaviors by the constant installations and withdrawals of the portable manometer.

RESULTS

	REP			
Columna1	Inventario	Interruptores	Subestaciones encapsulada	Total
Cantidad SF6 (kg)	3,403.70	6,351.68	2,304.00	12,059.38
Fugas de SF6 (kg) - Reposición		28.50	0.00	28.50
Recuperación de SF6 para Mantenimientos Mayores		22.80	0.00	22.80
Fugas Reales emitidas al ambiente				5.70
% de fugas	0.00	0.0045	0.0000	0.047%

CONCLUSIONS AND RECOMMENDATIONS

- There are ways for avoid leaks of SF6 in common practices.
- The correct handling of the SF6 could save money to the company, decrease the environmental impacts and avoid fines to the state.
- Safe procedures should be established during the handling of the gas, mainly in the loading and unloading activities in the power equipment, since this is where the greatest amount of emissions originates and the risk of contamination with air and humidity is higher.
- REP needs to find better ways for detect SF6 leaks in equipment and non equipment,.
- Rep could start acquiring technology equipment in vacuum for medium voltaje as a way to replace the SF6.

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