

# INCREASE OF LP GAS RELATED ACCIDENTS IN SRI LANKA

Findings of IESL to be Submitted to President  
Appointed Committee

10<sup>th</sup> December 2021

Jointly by Mechanical Engineering Sectional Committee and  
Chemical Engineering Sectional Committee of IESL



## Contents

1	Introduction .....	2
2	Problem Identification .....	2
2.1	LP Gas Quality.....	2
2.2	Failures in Gas Quality Inspection .....	3
2.3	Distribution of Non-Standard LP Gas Equipment to Consumers .....	3
2.4	Infiltration of Low-quality LP Gas Regulators.....	4
2.5	Non regulation of gas supply and consumer protection by Government institution.....	4
2.6	Irresponsible and Unfair Conduct of LP Gas Companies .....	5
2.7	Government Intervention Required to Protect the Consumers .....	5
3	Recommendations .....	6
3.1	Preventive measures .....	6
3.2	Investigations to identify root cause/s .....	6
4	Annexes.....	8
4.1	Annex 1.....	8
4.2	Annex 2.....	8
4.3	Annex 3.....	9



## **1 Introduction**

Sri Lankan domestic gas market is experiencing large turbulence at present on usage of LP gas cylinders. It was identified that many LP gas cylinders have entered the market with dangerous level of gas leaking, not having adequate level of gas leak detection smell (Ethyl Mercaptan). Many LP gas consumers had to face explosion in gas cookers and sometime gas related explosion that had damaged entire pantry area. Sri Lanka had experienced the LP gas related accidents within last two weeks which exceed the total number of cases report in the entire year.

Hence President had appointed a committee to investigate the issue in detail and this report is prepared jointly by Mechanical Engineering Sectional Committee (MESC) and Chemical Engineering Sectional Committee (CHESC) of the Institution of Engineers Sri Lanka (IESL) in submission of their opinion in this LP gas related accidents.

## **2 Problem Identification**

LP gas related incidents that took place could be divided into following categories.

1. LP Gas Quality related matters as reported by the CPC laboratory
2. Possible failures of quality inspection process on LP gas cylinders
3. Distribution of non-suitable LP Gas equipment to consumer by LP gas distribution companies
4. Distribution of non standard LP gas equipment by private importers to the public
5. Non regulation of quality of gas supply and consumer rights by any government institution
6. Irresponsible and unfair conduct of LP Gas companies
7. Lack of education of consumers on safe use of LPG either by the LPG Companies or the regulatory state agencies
8. The avenues for redress for the affected parties not being established and disseminated and monitored
9. Government intervention required to protect the consumer

### **2.1 LP Gas Quality**

It was established during last year, LP gas distribution companies had ordered LP gas with high percentage of propane. Also it was noted that they had imported gas cylinders that were already filled into the country without specifying the composition of LP Gas to the consumer affairs authority and consumers. Further in recent findings it was found that the LP Gas that was in the market is not having adequate odor that would alarm the consumer of gas leak. So as IESL, we strongly recommend obtaining necessary LP gas purchasing documents (specification, test results, etc.) including payment data and unveiling the true picture of selling LP Gas composition and impact to the consumer.



## 2.2 Failures in Gas Quality Inspection

Even though it was mentioned that LP Gas distribution companies have quality control procedure linked with automatic/manual inspection for LP gas cylinder before being dispatched. However many incidents of leaking gas cylinders with very high levels are reported through media institutions. Hence it was evident that the described quality control procedure is not practically applied in the production process and there are lot of loopholes that issue leaking gas cylinders to the consumers putting their safety at high risk. We believe the CCTV footage and unannounced inspection to be carried out by government regulator to control these types of careless mistakes in the operational activity.

Further, both Litro and Laugfs do not have mechanism to check the level of Ethyl Mercaptan which cause odor in leaking gas that enable the consumer identify the LP gas leaks. So it is recommended to force these companies to hire external laboratory which has the facility to check this important chemical that link to the safety of gas cylinder immediately and suitable random checks to be done accordingly.

Also it was identified during parliamentary commission questioning, that both companies had failed to provide data of rejected gas cylinder in the automated system and records of repairing carried out within last one year. This clearly indicates that these gas companies do not have proper quality review mechanisms that evaluate the repair of the gas cylinders issues that was identified at the automated filling line. Hence it is recommended to record all defects identified in the automated line and provide necessary information to regulatory authority on weekly/monthly basis to review and advice on corrective measures.

## 2.3 Distribution of Non-Standard LP Gas Equipment to Consumers

It was noticed that,

- According to SLS 1180:1998 (Specification for Pressure Regulators and Automatic Changeover Devices for LPG), both low-pressure and high-pressure gas regulators should have tested at an inlet pressure of 1.4 MPa (14 bar).
- According to SLS 712:1998 (Specification for LPG), maximum vapor pressure of Commercial Propane at 37.8 °C will be 1,430 kPa (14.3 bar) and Commercial Butane at 37.8 °C will be 485 kPa (4.85 bar).
- According to Specification for LANKA LPG (P-022)<sup>1</sup> indicated at Cypetco website, vapor pressure of LPG at 37.8 °C will be in between 413.8 – 620.7 kPa (4.13 – 6.21 bar). We must consider higher side of 6.21 bar.
- According to the publicly available technical data, 50% : 50 % Propane Butane mixture would reach above 5.5 bar at 30 °C and above 7.2 bar at 37.8 °C.

As such to ensure safe operation the regulators and accessories should be able to withstand a pressure of at least 9.0 Bar (0.9 MPa) with a factor of safety of 1.5. However, both gas companies had sold gas regulators which rated maximum inlet

---

<sup>1</sup> The propane to butane ratio has not indicated so we are expecting this would be 30% Propane – 70% Butane mixture.



pressure of 0.6 MPa (6 bar) while their LP gas vapor pressure is more than the rated maximum inlet pressure.

Under these circumstances it is a grave violation of consumer safety for the Gas suppliers to issue regulators through their distributors of any regulators of safety inlet pressure rating below 9.0 Bar (0.9 MPa) if the gas composition is maintained at previous levels. If a change on composition is approved, then this level of safe inlet pressure would need to be enhanced accordingly. Necessary compensation for damages and recall of all these gas regulators below the required rating should be done for public safety with cash refunds.

As per SLS 1180, pressure regulator shall be clearly and permanently marked as per below (chapter 6, Marking).

- a) Manufacturer's name or trade mark or symbol;
- b) Unique type reference;
- c) The year and the month of manufacture;
- d) The direction of flow clearly visible on the body, e.g. by an arrow;
- e) The type of gas;
- f) The maximum inlet pressure for which the regulator or device complies with;
- g) The nominal outlet pressure or pressure range;
- h) A relief valve indication, where such is incorporated; and
- i) The rated capacity in kg/h.

But there are several pressure regulators in the market without mention of inlet or outlet or both pressure ratings.

## **2.4 Infiltration of Low-quality LP Gas Regulators**

Many gas equipment suppliers to the local market had been able to import gas regulators that are only suitable to operate at maximum inlet pressure of 6 bar and sell it for use with domestic gas cylinders. As per above data pertaining to the gas in the cylinders issued by Litro and Laugfs this regulator is not suitable for their gas operating pressures. Hence proper investigation should be carried out to identify how these low-pressure gas regulators being infiltrated into the local market.

## **2.5 Non regulation of gas supply and consumer protection by Government institution**

It was noticed (according to the local media) that Litro Gas Company had implemented an experiment on change of Gas composition at the expense of consumers. So far this experiment had killed one person due to severe burning and caused many small injuries to consumers and their assets. This type of unannounced unapproved experiments affecting the entire consumer market at once are to be banned immediately and necessary action to be taken to identify the people who ordered this type of trial on change of LP Gas composition. We recommend a legal action against the identified officers who approved or ordered this type of trial on consumer market while compensating the victims adequately.



We further recommend applying the provisions of the factory ordinance on LP Gas cylinders as it is a pressure vessel in its nature of operation.

## **2.6 Irresponsible and Unfair Conduct of LP Gas Companies**

While many gas consumers find their gas cylinder are leaking excessively and pose high risk in use at domestic and industrial application, none of gas companies had taken any steps to recall the defective gas cylinders and compensate for the gas at purchased price.

Currently two main gas distribution companies try to pass the responsibility to the customer insisting a quality checkup by the consumer himself at the point of purchase. This is highly unacceptable considering the knowledge level of consumer to carryout such investigation. This is a clear act that LP Gas distribution companies try to disregard their responsibility and pass all burdens to the consumer. We recommend to impose strict return policy for LP gas cylinder that are proven to be defective and found to be leaking gas.

## **2.7 Government Intervention Required to Protect the Consumers**

we as IESL believe that any attempt to accept the past accidents and allow gas companies to continue their business without remedial measures as stated in some quarters is not acceptable as there is no assurance that such accidents could not happen again.

We expect government support to put in place adequate controls and preventive measures covering the points described above to ensure consumer protection as far as possible with good engineering practices and safety precautions with the participation of necessary stake holders and state agencies.

Hence, we as IESL request Government to conduct detail study into these accidents while LP Gas system operates under strict control of Consumer Affairs Authority. We further request to take necessary legal action against any proven violation of consumer safety and compensate the consumers affected with adequate levels.



### 3 Recommendations

#### 3.1 Preventive measures

1. Sri Lanka needs to take serious consideration when any institution is planning to implement an alteration to the existing conditions of approval and policies. This action to be supported with internationally accepted detail study considering all pros and cons. wrong decisions have impacted the whole economy and entire society.
2. Monitoring procedure for quality and safety of LP Gas cylinders and their usage is to be implemented without solely giving the responsibility to the LPG supplier Litro and Laugfs.
3. Proper study to be carried out and system needs to be established to create Gas cylinder ID, and its permissible service life, history of service and repairs and traceability.
4. Litro and Laugfs need to establish a application software for report of Gas cylinder defects similar to the one used by Ceylon Electricity board having all necessary traceability in attending the faults and rectification of the same.
5. Litro and Laugfs needs to issue safe operation data sheet with each cylinder sale in Sinhala/Tamil/English for creating customer awareness and telecast/published safety advertisements on all the medias at their cost at proper intervals in peak hours.
6. IESL would like to request from the president appointed committee to recommend passing a special law in the parliament to prevent further irresponsible acts of this nature in respect of all consumer goods and services and safeguard general public against these type of irresponsible behavior by companies/people

#### 3.2 Investigations to identify root cause/s

	What can go wrong	How to Investigate
	<b>Supplier / Gas Companies Responsibility</b>	
1.	Propane to butane ratio (tank pressure) - Compliance with existing standards	1. Samples to be tested by CPC Lab
2.	Inferior Quality of the replacement rubber washer in the cylinder valve - Possible deterioration early in usage	1. No of detections in QC process exceeding historical records 2. Testing of random samples at ITI or RRI labs
3.	Gas leak detection system in filling stations	1. Checking against historical records of rate of rejections and actions taken



	- Established procedure for QA on this parameter using approved calibrated measuring instruments - Adequacy of the test procedure	2. Random sample cylinders to be tested at independent laboratories
4.	Not using water bath/boat to check gas leaks after filling (omitting the fool proof method)	1. Inspection of filling station facilities 2. Checking records by independent party / CAA
5.	Inadequate levels of Odorant to identify gas leaks at consumer premises	Samples to be tested by a suitable Lab
6.	Selling inferior quality or non-standard regulators / hoses by gas companies	1. Checking samples issued to approved distributors at SLSI for compliance to standards 2. Market research and visits to consumer premises to identify the real status.
	<b>Accessories in the Consumer premises and in the Market</b>	
1.	Regulator compliances with SLS	1. Investigation of the import documentation and possibility of by-passing verification at point of entry. 2. In adequacy of data supplied to customs authorities on standards applicable and evidence needed to check for compliance
2.	Quality of regulators in the market	Testing of samples in the market for label information and actual testing of samples at SLSI labs
3.	Gas hose compliances with SLS	Checking of samples on sale at SLSI Labs
4.	Using inferior quality hoses by customers / technicians	Adequacy of dissemination of information by LPG companies to consumers
5.	Not replacing regulators on time (5 years)	
6.	Not replacing gas hoses on time (2 years)	
7.	Quality issues on gas cookers in the market	Setting up standards if not in place Adequacy of dissemination of information by LPG companies to consumers
	<b>Consumer's Awareness</b>	
1.	Maintenance of equipment's and accessories	1. Check the awareness level of consumers
2.	Replace them on time	2. Check the Adequacy of dissemination of information by LPG companies/ CAA /SLSI to consumers



## 4 Annexes

### 4.1 Annex 1

SLS 712 : 1998

**TABLE 1 - Chemical and physical properties of liquefied petroleum gases**

Requirements (1)	Product designation				Test methods (6)
	Commercial Propane (2)	Commercial Butane (3)	Commercial PB Mixture (4)	Special duty Propane <sup>A</sup> (5)	
Vapour pressure at 37.8 °C, max., kPa	1430	485	<sup>B</sup>	1430	SLS 1166 ASTM D 2598 <sup>C</sup>
Volatile residue: evaporated temperature, 95%, max. °C	-38.3	2.2	2.2	-38.3	ASTM D 1837
or					
butane and heavier, max. vol. %	2.5	...	...	2.5	ASTM D 2163
pentane and heavier, max. vol. %	...	2.0	2.0	...	ASTM D 2163
propylene content, max. vol. %	...	...	...	5.0	ASTM D 2163
Residue on evaporation 100 ml.	0.05	0.05	0.05	0.05	ASTM D 2158
Max. MI					
Oil stain observation	pass <sup>D</sup>	pass <sup>D</sup>	pass <sup>D</sup>	pass <sup>D</sup>	ASTM D 2158
Relative density at (15.6/15.6 °C)	<sup>E</sup>	<sup>E</sup>	<sup>E</sup>	<sup>E</sup>	ASTM D 1657 ASTM D 2598
Corrosion, copper, strip, max.	No.1	No.1	No.1	No.1	SLS 1168 <sup>G</sup>
Sulphur, ppmw	185	140	200	123	ASTM D2784
Hydrogen sulphide	pass the test	pass the test	pass the test	pass the test	SLS 1169
Moisture content	pass	...	...	pass	ASTM D 2713
Free water content	none <sup>F</sup>	none <sup>F</sup>	none <sup>F</sup>	...	

Source: SLS 712:1998, Page no. 6

### 4.2 Annex 2

#### 7.4 Soundness test for low pressure regulators

Test the completed regulator at a pressure of 15 kPa applied through the outlet connection and held for a period of not less than 60 s.

Test those parts normally subjected to cylinder pressure at a pressure of 1.4 MPa applied through the inlet connection and held for a period of not less than 120 s with the outlet connection sealed.

#### 7.5 Soundness test for high pressure regulators

Test the completed regulator at a pressure of 1.5 times the maximum outlet pressure obtainable from the regulator, applied through the outlet connection and held for a period of not less than 60 s.

Test those parts normally subjected to cylinder pressure at a pressure of 1.4 MPa applied through the inlet connection and held for a period of not less than 120 s with the outlet connection sealed.

Source: SLS 1180:1998, Page no. 26



### 4.3 Annex 3

## TECHNICAL SPECIFICATION : LANKA LPG (P-022)

### SPECIFICATION FOR LANKA L P G (P-022)

Property/Test	Test (IP)	Method(ASTM-D)	Specifications
Vapour Pressure @37.8 <sup>0</sup> C kPa(Pa)		1267	413.8-620.7(60-90)
Boil Test		1837	
10% Vol. Evaporated <sup>0</sup> C			Report
50% Vol. Evaporated <sup>0</sup> C			Report
75% Vol. Evaporated <sup>0</sup> C			Report
95% Vol. Evaporated <sup>0</sup> C			Max 3.3
>Residue % voll@ 37.8 <sup>0</sup> C			Max 1
Composition		>GLC	
Propane % vol			Report
Butane % vol			Report
C5+%mol		2163	Max2
Suophur content ppm – Un-stenched		2784	>Max 200
RSH ppm		2420	Max 50
H2S (Doctor Test)			Sweet / 0.75mg m3 max
Cu Strip corrosion 2 hrs @ 37.8* C		1838	max1
Dicnes content mol%		GLC	Max 0.5
Alkynes content mol%		GLC	Max 0.5

Source: <https://ceypetco.gov.lk/LankaLPG/>