

## **PROFESSIONALS ROLE IN QUALITY ASSURANCE PROCESS**

Mr. P. H. Sarath Gamini

Project Director

Greater Kandy Water Supply Project (NWS&DB), Pahala Kondadeniya, Katugasthota, Kandy, Sri Lanka.

Tel: 077-7809661 ; E-mail: nwsdbgkp@sltnet.lk

National Water Supply & Drainage Board (NWS&DB) is a Statutory Board established by National State Assembly of the Republic of Sri Lanka under Law No. 2 of 1974. During the past 35 years, water supply facilities have been improved in urban and rural areas and have objectives of reaching 75% of population to have access to safe drinking water by year 2025.

There are more than 1.2 million domestic piped water connections maintained by NWS&DB. In addition to that, community water supply projects local authority schemes cover more than 800,000 domestic water supply connections. Individual water supply facilities also are available in various parts of the country with in-house water and sanitation facilities, such as, washrooms, toilets etc.

All these water pipeline connections require pipe fittings, such as,

- Stopcocks
- Water meters
- Ferrules
- Clamp saddles, etc.

NWS&DB alone distributes more than 480MCM per year through various reservoirs, storage tanks and flow of water is regulated by various valves, ball float valves and sluice valves etc.

Major water apparatus and measuring devices used in water sector are given below.

- Domestic water meters
- Bulk meters
- Ball float valves for large reservoirs
- Ball float valves for domestic household storage tanks
- Clamp saddles
- Ferrules
- Angle valves
- Bib Taps
- Hot/ cold Water Taps

- Cisterns
- Bidet shower etc.,

A major issue in water sector today is the incidents of high proportions of non revenue water (NRW) by which treated and potable water is wasted. This is not a desirable state as far as the objective of water sector is concerned, and therefore, has to be controlled and curtailed.

It is observed that the non revenue water content is about 35% of the total supply. Main reasons for this situation is –

1. Leakages in the pipes and fittings
2. Illegal tapping
3. Errors in water meters
4. Poor plumbing practices etc.

Major causes of leakages are due to poor quality standards of pipes and fittings. Even though PVC pipes has got certain standards, all other fittings and water meters are purchased following quick procurement processes where quality aspects are not necessarily being considered.

Good quality pipes and fittings cannot be found easily as there are no restrictions on imports of water apparatus, stopcocks, cisterns, ball valves etc.

This paper deals on the weaknesses of such procurement processes and suggests suitable remedial measures at national level as well as individual user levels.

### **Procurement of Water Apparatus and fittings**

NWSDB as the National Organisation procures Rs.5 Billion worth of various water apparatus (including pipes) annually. In the procurement process, quality assuring measures are adopted such as,

1. Quality management system for manufacturing organisations process – ISO 9001 – 2000, ISO – 9001 : 2008
2. Product specific, accreditation certificate (product certificate)
3. Specific test certificates during the delivery of goods
4. Calibration tests for sample of water meters (Domestic)
5. Enduser certificate (applicable only in Greater Kandy Project)
6. Endurance Certification (procurement of water meters in large quantity 50,000; 100,000)

### Greater Kandy Water Supply Project inputs to the water sector

Greater Kandy Project has initiated non-revenue water reduction and prevention programmes and various studies have been carried out on existing procurement process related to water apparatus, fittings and found following observations.

1. Except for domestic meters, for all other apparatus only 03 certificates (1, 2, 3) have been insisted during the procurement process.
2. Endurance test certificates were insisted only for 15 mm domestic water meters (it does not apply now)
3. An enduser database has not been properly established in Sri Lanka for water apparatus.
4. Endurance test facilities are not available in Sri Lanka and it is very expensive.  
(Cost of endurance test is done in Singapore and it takes 7 weeks. Initially it is Rs. 6 Million for modifying of test apparatus and after that Rs.4 Million for each three sample tests)
5. Some manufactures produce forged product certificates
6. In some countries, accreditation process (sample testing, random technical auditing, issue of certificate) does not function effectively. Accreditation agencies issue certificates in a positive manner in order to obtain quality accreditation assignments regularly.
7. Most of the local agents or distributors of water and sanitary fittings of Sri Lanka are not aware of applicable standards for water fittings. According to traders, response from the user community on applicable standards is very poor. (more than 50 tender documents were sent to leading manufacturers and other agents and importers for procurement of 40 water / sanitary fitting sets in order to assess the actual situation).
8. Some accreditation agencies issue product certificates with conditions as they are aware of repercussion on quality of fittings.

The studies carried out by Greater Kandy Water Supply Project reveal that traditional procurement process has to be reviewed and new indicators are to be introduced in order to ensure quality water fittings available in the market.

**Following actions are recommended.**

1. Introduce endurance test certificate for all possible items in order to estimate the service life and performance of the product.
2. An enduser database is to be established based on information from the users by the national utility organizations, such as National Water Supply & Drainage Board for water fittings and in case of electricity fittings by Ceylon Electricity Board.
3. Enduser test apparatus are quite expensive, and therefore, it should be procured or fabricated locally.
4. Awareness campaigns are to be carried out among manufacturers, agents of various water product manufacturers on quality aspects and long term measures that are to be implemented by regulatory authorities.
5. Sri Lanka Standards Institution should take initiative to introduce new standards for water fittings and enduser test apparatus are to be introduced through respective national agencies.
6. Consumer Affairs Authority has legal provisions for maintaining of quality goods and services in order to protect the consumer rights.
7. Respective utility agencies should formulate new strategies to have an integrated approach with Sri Lanka Standards Institution and Consumer Affairs Authority, user groups, manufacturers, their agents and traders to establish quality assurance systems.

Greater Kandy Water Supply Project has developed an endurance test apparatus for stopcocks as a sample to promote quality assurance systems in the water sector. Details are summarised below. For more details, please Refer *Annex 1*.

#### **ENDUSER TEST APPARATUS DEVELOPED BY GREATER KANDY WATER SUPPLY PROJECT**

Performance of this test apparatus is to check the lifetime or performance of stopcocks.

Procurement method : Local tendering  
Design and Built



Total cost of the apparatus : Rs.600,000/=

Contractor : M/s. Emac (Pvt) Ltd.

Sample output : Given below

<b>Date</b>	<b>Brand</b>	<b>Country Of Manufacturer</b>	<b>Cause For Failure</b>	<b>Number of Rotations When Failure Occured</b>
23/04/2010	Peglar 709	UK	Leak through gland	3670
1/5/2010	QJ	China	Leak through gland	2652
3/5/2010	SFI	China	Leak through gland	293
3/5/2010	Ningbo	China	Leak through gland	2720
5/5/2010	Melco	China	Leak through gland	3478
7/5/2010	Pegler 774F	UK	Leak through gland	7684

## BASIC COMPONENTS OF THE ENDURANCE TEST APPARATUS

### STOPCOCKS ENDURANCE TEST APPARATUS



### GREATER KANDY WATER SUPPLY PROJECT

International Conference on Sustainable Built Environments (ICSBE-2010)  
Kandy, 13-14 December 2010

## **CONSUMER'S CHOICE**

Product promotion campaigns are extensively carried out using electronic and print media. Therefore, consumers are unable to find the quality of the products easily and most of the consumers are not aware of the methodology on finding quality goods and services. In order to protect the interest of consumers and the service providers, regulatory authorities have been established in Sri Lanka.

Few related regulatory agencies are given below.

### **1. CONSUMER AFFAIRS AUTHORITY**

#### **Mission**

*Safeguard consumer rights and interests through consumer empowerment, regulation of trade and promotion of healthy competition.*

*Consumer Affairs Authority considers that protection of consumer rights is a means of developing responsible civic society.*

#### **Objectives**

- *Take necessary action for the protection of the consumer against manufacturers and traders in respect of labeling, price marking, packeting, sale or manufacture of any goods*
- *Issue general directions on labeling, price marking, packeting, manufacture and sale of any goods*
- *For the purpose of protecting the consumer, determined the standards necessary to ensure the quality of goods and services*
- *Determine the "Specific Goods" which is essential for the living and place such goods under price regulation for the wellbeing of consumers*
- *Carryout investigation in regard to the prevalence of any anti competitive practices, which prevents, restricts or distorts competition, with regard to the sale of goods or provision of any services*

### **2. SRI LANKA STANDARDS INSTITUTION**

#### **Mission**

*To undertake, promote and facilitate Standardization, Measurement, Quality Assurance and related activities in all sectors of the national economy in order to*

- *Related activities in all sectors of the national economy in order to*
- *Increase productivity and maximize the utilization of resources*
- *Facilitate internal and external trade*
- *Achieve socio-economic development*
- *Enhance international competitiveness of products and services*
- *Safeguard the interest of consumers while improving the quality of life of employees of the Institution*

#### **Strategies**

- *To formulate National standards required for the development of the National Economy*
- *To promote the use and application of national standards in all spheres of economic and social activity*
- *To promote quality assurance in all sectors of the economy*
- ***To promote and disseminate valid measurement practices at nation level***
- ***To provide consumer education and consumer protection***
- ***To educate and train industry and service personnel on concepts, practices and techniques of standardization and quality management***
- ***To provide test facilities and develop the national test capability***
- *To provide documentation and information services on standards, technical regulations and related publications*
- *To participate in international and regional standardization activities to safeguard national interest*
- *To constantly develop and upgrade the Institution and its resources*

### 3. **PUBLIC UTILITIES COMMISSION OF SRI LANKA (PUCSL) – ACT NO. 35 OF 2002**

#### Mission

*Regulate all the utilities within the purview of the Public Utilities Commission of Sri Lanka, to ensure safe, reliable and reasonably priced infrastructure services for existing as well as future consumers in the most equitable and sustainable manner.*

#### Objectives

- ***Protect interest of all consumers***
- *Promote competition*
- *Promote efficiency in both the operations of and capital investment in, public utilities industries*
- *Promote an efficient allocation of resources in public utilities industries*
- ***Promote safety and service quality in public utilities industries***
- *Benchmark, where feasible, the utilities' services as against international standards*
- *Ensure that price controlled entities acting efficiently, do not find it unduly difficult in financing their public utilities industries*

### 4. **NATIONAL WATER SUPPLY & DRAINAGE BOARD (NWS&DB)**

#### Mission

*Serve the nation by providing sustainable water and sanitation solutions ensuring total user satisfaction.*

NWS&DB Law, No. 2 of 1974

Extract of Clause 90.2 – Regulatory measures to be implemented by National Water Supply & Drainage Board

- a. any matter required by this Law to be prescribed or in respect of which regulations are authorized by this Law to be made ;
- b. the licensing of plumbers and the control of plumbing and plumbing fixtures;
- c. the preservation and maintenance of the water works of the Board;
- d. the control of the use of water supplied from the said waterworks;
- e. the prevention of the waste, misuse, undue consumption, or contamination of the water supplied for public or private use;
- f. the size, nature, strength and materials, and the mode of arrangement, position, alteration, removal, renewal and repair of the apparatus and receptacles to be used for the purpose of the waterworks of the Board;
- g. the control of the public supply of water by stand pipes, and use of such water;
- h. the control of the supply of water and the provision of sewerage by private services, and the materials and fittings to be used for the purpose;

## **CONCLUSION**

Considering their mission statements of the said authorities and their strategies related to providing quality goods and services, ample opportunities are available for the society to obtain high quality goods and services. At the moment, even though statutory organizations exist, there are some deviations on implementation of regulatory measures empowered to them.

What are the measures required?

Who should do?

## **Measures**

- Develop standards for products
- Enforce standards by way of measuring quality of goods using test apparatus
- Educate customers / consumers
- Establish enduser database

**International Conference on Sustainable Built Environments (ICSBE-2010)  
Kandy, 13-14 December 2010**

- Carryout consumer surveys on products, reliability, life cycle, cost etc.
- Identify deficiencies of goods and services
- Provide the feedback to manufacturers, trading agencies who can upgrade the quality of goods and services
- Aware consumers on methodology to select goods and services

Similarly, we can list out so many measures.

#### Who should do?

All those measures are the typical roles and functions of professionals, such as –

- Civil Engineers
- Mechanical engineers
- Electrical Engineers
- IT Experts
- Scientists
- Legal Draughtsmen
- Sociologists
- Economists
- Administrators, etc.

Considering all above, it is high time to develop an integrated approach to introduce appropriate regulatory measures in the water sector, specifically in order to provide quality goods to the consumers.

- Appropriate quality testing systems (endurance tests, calibration, strength of materials, property of material etc.) are to be developed locally in order to minimize the cost of quality monitoring systems
- Professional associations should take initiative actions to have an integrated approach with all stakeholders to address public issues, such as, availability of poor quality water fittings.
- Professional associations should campaign for high quality services through regulatory authorities and involving other stakeholders.

- Involve Universities, Technical Colleges, University of Vocational Technology to develop and carryout appropriate tests for various products.
- Enduser database is to be established in each utility service agency or major service organisation. A mechanism is to be developed to analyse enduser database and provide the feedback to manufacturers and regulatory agencies, such as, Sri Lanka Standards Institution, Consumer Affairs Authority, Public Utilities Commission of Sri Lanka, Telecom Regulatory Commission etc.

I hope that IESL Kandy Centre may take appropriate action to promote regulatory measures in water sector in order to establish quality goods and services to improve quality of life of people in Sri Lanka.

## **OBJECTIVES OF ENDURANCE TEST APPARATUS FOR STOPCOCKS**

National Water Supply & Drainage Board procures more than 100,000 stopcocks annually to provide water connections to consumers and to replace defective stopcocks. To ensure the quality of same through conducting sample endurance tests is the objective of fabricating this apparatus.

The work scope has been included in the design for the fabrication, supply, installation, commissioning and training the users of an apparatus for performances tests of stopcocks 15mm. diameter.

Greater Kandy Water Supply Project Phase I, Stage II is planning to procure 3,000 stopcocks under its non revenue water programme. This work is planned to implement as a model project with developing quality standards in house water connections and avoiding procuring low quality products to National Water Supply & Drainage Board. Further, we are planning to introduce low cost solutions to water industry for its long term sustainability.

A contract was awarded to design fabricate, supply, installation and training the users of the apparatus for performance test of stopcocks (15mm) procured by National Water Supply & Drainage Board, Sri Lanka. The scope includes all labour, machinery and all materials necessary for the proper manufacture of the apparatus, installing at specified location, testing and commissioning.

### **Design of test apparatus**

The designer / fabricator has been instructed to do the design the apparatus to meet the following specifications.

### **Technical Capability**

The apparatus to be able

- To operate at least one million open close cycles without major repair
- To couple of the mechanism to the hand wheel of the stopcock
- To detect leaks from outside as well as inside (non closure) by water drops
- To prevent dry operation
- To handle power supply failure during testing session
- To withstand water pressure up to 10 bars



#### Major items to be included

- Test table
- Water tank
- Pressure pump with regulator
- Geared motor or servo motor with fixing and mechanism to open / close valves
- Leak detection sensors inside / outside
- Control panel with remote digital counter to count the number of valve open/close cycles.
- Protection against over torque
- Timers and limit switches to facilitate the test

#### Mechanical Features of Apparatus

The valve turning mechanism shall be attached to or detached easily from the hand wheel of the valve under test by the operator. It shall not exert any lateral or vertical force to the valve body or stem during the test and shall not vibrate to make undue noise. The coupling of the hand wheel to the drive attachment shall not involve any form of valve dismantling, drilling, cutting or gluing. The attachment shall have provision for hand wheel vertical travel of 3 cm during open / closing.

The test apparatus shall have a resetting facility (0000 to 9999 or higher) counter which counts the number of valve open/close cycles and cumulative counter (000,000 to 999,999 or higher) for total number of valve open/close cycles. This counter is used as a check for the usage for the endurance tester. There shall be two independent timers to set the valve close time and valve open time (0~ 180 s minimum).

The valve close torque shall be adjustable. A separate safety torque switch shall be incorporated with trigger alarm and stop the motor when the open/close torque is beyond the servo motor specification.

The test apparatus once started shall continue to open and close the stop valve until water leak or other alarm is triggered.

#### Design and Fabrication

Emac (Pvt) Ltd., Kandy was selected to carryout the design and fabrication work through competitive bidding and awarded the contract.

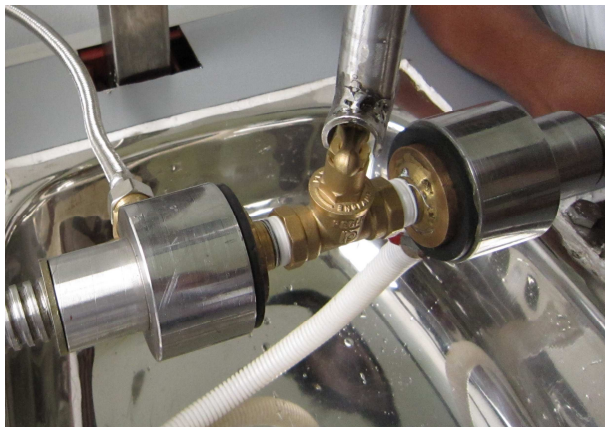
Their bid price for fabricating this machine including testing and training was Rs.584,500./=.

After submission of design proposal and drawings, the apparatus was fabricated as show below.

#### 4.1 Control & Display Unit



#### 4.2 Valve Clamping Unit



#### 4.3 Pressure Pump



#### **4.4 Battery & Battery Charger**

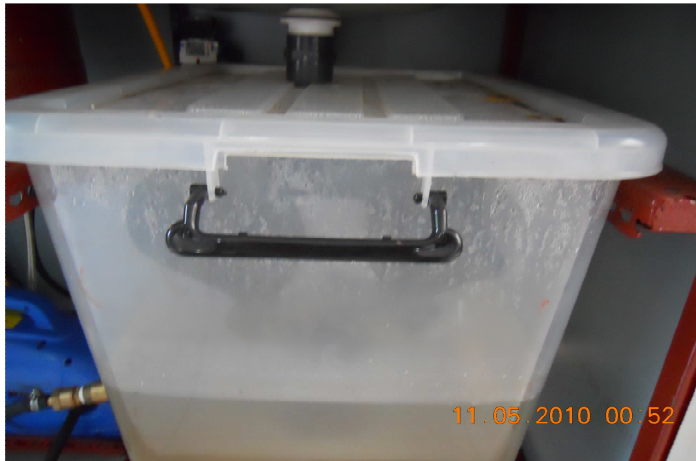


#### **4.5 Servo Motor Unit**

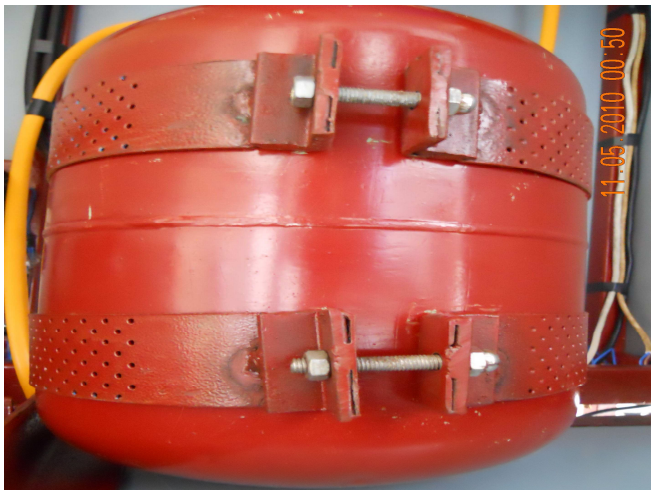


#### **4.6 Water Tank**

**International Conference on Sustainable Built Environments (ICSBE-2010)  
Kandy, 13-14 December 2010**



#### 4.7 Pressure Cut-off Valve



#### 4.8 Limit Switches



This machine contains following major components.

**International Conference on Sustainable Built Environments (ICSBE-2010)  
Kandy, 13-14 December 2010**

### Operation principle

The following features are incorporated.

- Operate at least one million open close cycles, without major repair
- Leak detection from outside as well as inside
- Prevent dry operations
- Handle power supply failures during testing session
- System to withstand water pressure up to 10 bars

The equipment include the following facilities.

1. Pressure pump to maintain constant pressure in the system during the testing session
2. Adjustable pressure regulator to maintain required pressure up to 10 Bars
3. 24 hr time is provided to have continuous operation, (For endurance test equipment can be set automatic operation for pre-set time intervals.
4. 0-5 min timer is provided to maintain fully close time up to 5 min and 0-60s time to for fully opened time up to 1 min.
5. Counter (0000 to 9999) is provided for each operation cycle.
6. counter (0000 to 9999) is provided for leakages and cumulative counter for open/close cycles. (if the valve leaks pressure pump will start before the preset times)
7. Geared motor is provided for smooth operation of hand wheel or close/open lever mechanism
8. Universal coupling mechanism to couple the rotary spindle of geared motor to the close/open mechanism of the valve
9. Adjustable limit switches are provided to maintain the optimum seating position of closing and opening.
10. Auxiliary water flow switch.