CHAPTER 6

ANALYSIS OF TESTING RESULTS

6.1 Water flow rate and volume relationship

Data from testing in chapter 5 are plot in figure 6.1, Graph show relationship between water flow rate and water volume that flow through valve. At the beginning flow rate, 1 litre/minute, ratchet gear can not release the lock ratchet. It causes the energy of water flow rate lower than the release requires torque. The distortion alignment of transmission gear and distortion of ratchet also effect the test result.

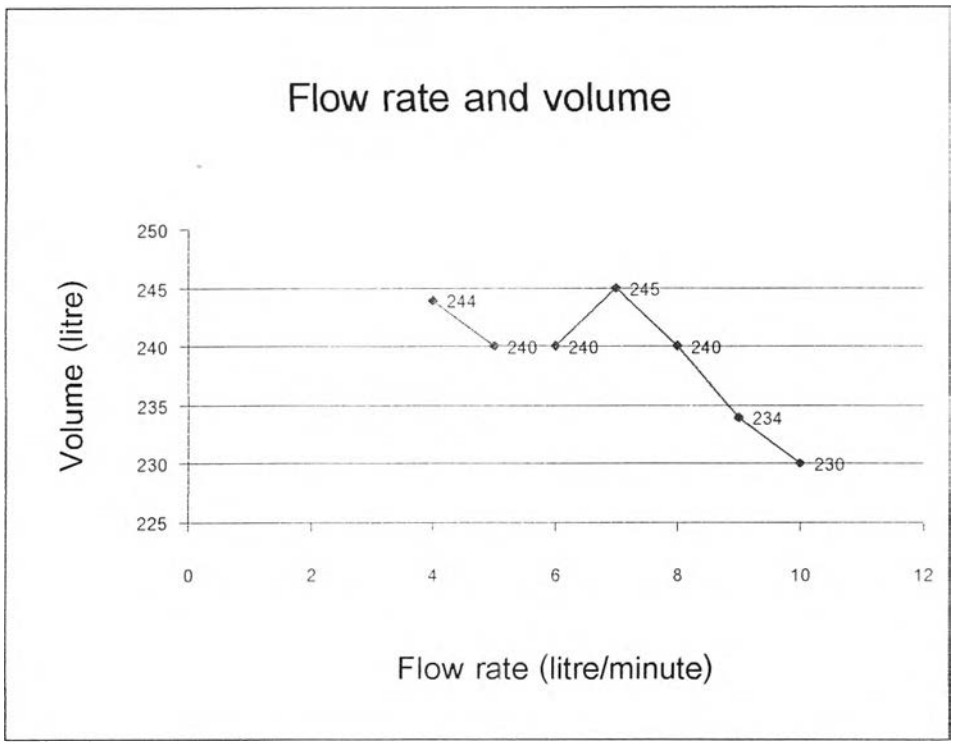

Figure 6.1 Water flow rate and volume of volumetric faucet

Result from the graph shows the trend of reducing volume when water flow rate increase. An average volume of this testing is 239 litre. Standard deviation of volumetric faucet is 5.32 litre so the percentage of average water volume deviation calculate as follow

$$\text{Water volume deviation} = \frac{100 \times 5.32}{239} = 2.22\ \%$$

The average volume and deviation percentage will be important for further development.

6.2 Open volumetric faucet's torque

From the data result in table 6.1 , moment of open ratchet lock force can be calculate according to formula

$$M = F \times r$$

M = Moment

F = Force

R = Perpendicular distance between center and force's apply point = 77 mm.

Testing	Force (gram)	Force (N)	Moment (N.m)
1	920	9.016	0.694
2	930	9.114	0.701
3	930	9.114	0.701
4	930	9.114	0.701
5	925	9.065	0.698
6	925	9.065	0.698
7	925	9.065	0.698
8	930	9.114	0.701
9	935	9.163	0.705
10	935	9.163	0.705
Average		9.099	0.700

Table 6.1 Moment need to turn on faucet prototype

Average moment to turn volumetric faucet on and off is 0.70 newton-metre. This moment is higher than moment of torsion spring store , 0.310 newton-metre, this cause volumetric sometime faucet can not return back to origin at close position. Possible reason is the friction of spring surface and torsion spring displacement. This can be solve by redesign spring hosting and torsion spring.

6.3 Release ratchet lock moment

From the data result in table 6.2, moment of open ratchet lock force can be calculate according to formula

$$M = F \times r$$

M = Moment

F = Force

R = Perpendicular distance between center and force's apply point = 27.5 mm.

Testing	Force (gram)	Force(N)	Moment (N.m)
1	345	3.381	0.122
2	320	3.136	0.114
3	325	3.185	0.115
4	310	3.038	0.110
5	330	3.234	0.117
6	350	3.430	0.124
7	365	3.557	0.130
8	320	3.136	0.114
9	325	3.185	0.115
10	325	3.185	0.115
Average		3.248	0.118

Table 6.2 Moment need to release lock's ratchet

The average open volumetric faucet's torque is 0.118 newton-metre that lower than moment calculation in design (0.85 newton-metre) this causes the distortion length in building prototype and the angle of lock ratchet not on position as design. It is effect from the working of torsion spring which buckling when turn faucet on lock position.

6.4 Comparing design specification and prototype testing result

Results of testing prototype bring to compare with engineering specification show in table 6.2 from QFD method in chapter 3.

Engineering specification	Target from QFD Technqiue	Prototype's testing results
Inlet diameter (inch)	1/2	1/2
Weight (Kg)	0.5 or less	0.65
Steps to install	1	1
% Volume change on different flow rate	15 or less	2.22
Maximum volume range (litre)	100	239
Open torque requirement (N.m)	0.5	0.7
Width (mm.)	65	65
Thickness (mm.)	65	65
Length (mm.)	100	110
Electricity required (Yes/No)	No	No

Table 6.3 Prototype's testing results and engineering specification