

### **New Water Operations Technique**

### Guarantees

## Constant Area Pressure And Asset Perfect Operating Condition







#### Water Supply System



1- How To maintain constant area pressure considering the continuous change in the demand along the day " day/ night", week " working days/ week end and year seasons " winter / summer"?



# 2- How to Operate Pumps within the pump performance curve with the same wide change in the demand considering the rapid development in the State of Qatar?



### How to Maintain Constant Area Pressure?

- It's well known that to pump flow from Point –1 to Point-2 you need to overcome the static head in addition to losses in the line
- H=Static Head +Head Loss
- HIf= Kf \* V<sup>2</sup>/2g = Kf \* Q<sup>2</sup>/2g \* A<sup>2</sup> , HIp= f\*L\*V<sup>2</sup>/2g \* D= f\*L\*Q<sup>2</sup>/2g \* D \* A<sup>2</sup>
- Head Loss is function of Q<sup>2</sup>
- H=Constant1+Constant2 xQ<sup>2</sup>



#### System Curve



H=Static Head +Head Loss H=Constant1+Constant2 xQ<sup>2</sup>

## Pumping To Complex network



For complex network we have infinite number of system curve and infinite number of pump performance curves.

To define the operation point we need to maintain the pressure in the network highest point

In Old Method before SCADA we were following the system curve by measuring the area pressure to increase / decrease the pump pressure <u>but only in the time we</u> <u>measure not all day</u>.

## How to Define system constants without complicated calculations for Highest Point in each RPS?



# How To Operate Pump within Recommended Operation Range?



Pump Performance curve for two Duty pumps operation

### One Pump Running in Healthy Condition



### One Pump Running outside performance curve



## 2<sup>nd</sup> duty pump should start to avoid damaging running pump



#### Two pumps operating outside performance curve



## Throttling valve closes to Bring operating point within recommended range



## Actual Flow pressure trend Shows Throttling valve operation



## Two pumps operating outside performance range – low flow

![](_page_15_Figure_1.jpeg)

### One pump Stopped back to healthy operation

![](_page_16_Figure_1.jpeg)

## One pump operating outside performance curve- low flow

![](_page_17_Figure_1.jpeg)

#### Recirculation valve open –back to healthy operation

![](_page_18_Figure_1.jpeg)

![](_page_19_Figure_0.jpeg)

## Two Graphs showing Operating points before and after applying New Technique

![](_page_20_Figure_1.jpeg)

## Benefits achieved by Applying new operation technique

- 1. Constant area pressure in full auto method
- 2. Helps in KM target of unmanned station with minimum human interference
- 3. Our system is intelligent with handling network changes ,reduces the risk when handling shutdown works, now NWCC just isolate affected area without need to stop or reduce RPM and again to bring the pressure back manually
- 4. Eliminate human error when deciding the required set points by measuring or using the historical dada
- 5. Provide the desired pressure without any unrequited increase saves the power  $P = Q \times H/75x\eta$
- 6. Keeping pumps operating within recommended operation range prolong the use of assets
- 7. Operating pumps within healthy range assure operation in the best efficiency range of pump, reduces consumed power and energy cost P= Hydraulic power  $/\eta$
- 8. Knowing the system curve and pump performance curve ease the analysis when problems observed

## Thanks & Regards