CW-DC Pty Ltd

DARWIN CITY WATERFRONT LAGOON LEVEL CONTROL

Tuesday, August 22, 2006

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Introduction

The Lagoon Level Control System is designed to effectively monitor the changes in open water sea level and control the lagoon level in order to maintain a flushing cycle of water. The control system will ensure that the likelihood of a high level in the lagoon causing damage is minimised. The ITT Flygt Pump Management Control Panel will be capable of monitoring all facets of the pumping system and then generate and page out alarms when a fault condition occurs. The ITT Flygt Pump Management Panel will also collect and trend all relevant data from the pumping assets.

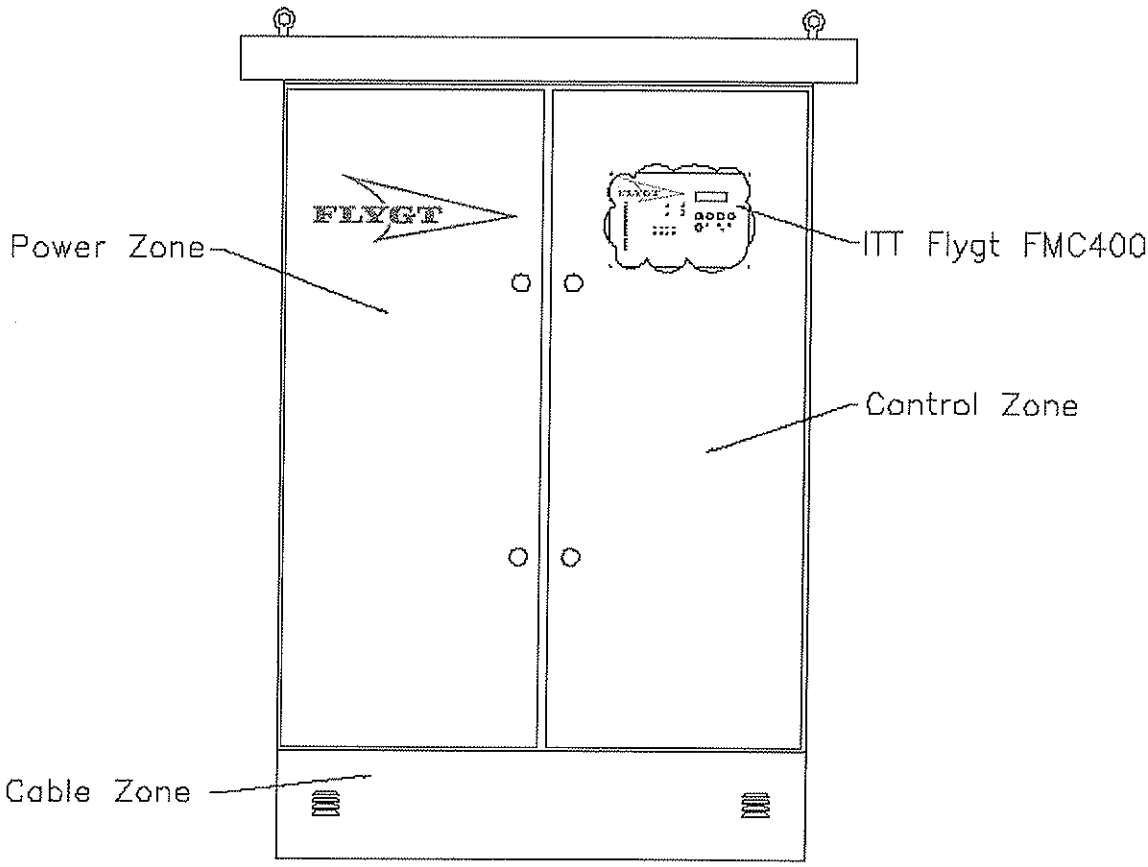
The ITT Flygt Pump Management Panel will be a SCADA ready device capable of communicating with ITT Flygt Aquaview SCADA software using an analogue PSTN phone line installed on site. The installation costs and account fees are not part of this tender.

1. Control Panel Overview

The ITT Flygt Pump Management Panel once installed will:

- Provide data to analyse the operation of the pumping asset;
- Provide full Aquaview SCADA capabilities using a local PC equipped with Aquaview software or via the internet accessing the ITT Flygt Aquaview server;
- Continuously collect operational data/trends from each of the pumping asset;
- Collect and store operational data/trends which can be used to predict future faults and assess the suitability of the existing waste water network to handle existing and future needs;
- Provide the ability to remotely control the pumping asset using Aquaview pump management

1.1 PROPOSED CONTROL PANEL LAYOUT



1.2 PUMP MANAGEMENT CONTROL PANEL SPECIFICATIONS

Control Panel to be fabricated from 2.0mm 316 Stainless Steel sheet and to be powder coat white.
All materials including hinges, locks fixings etc are to be 316 Stainless Steel.
ITT Flygt FMC 400 Intelligent Pump Controller
ITT Flygt MAS711 monitoring unit
ITT Flygt MD45 Communication module
ITT Flygt Mini CAS Pump Supervision Relay
ITT Flygt LS100 Level Sensor
ITT Flygt DC Regulated Power Supply
ITT Flygt PSTN Modem with phone line surge diverter.

- Motor Circuit Breakers — Telemecanique GV2 with padlockable handles or equivalent
- Control Circuit Breakers — Merlin Gerin Din C 60N
- Electronic Soft Starters — Danfoss MCD202-045-T4-CV1
- Current Sensors — ITT Flygt 4-20mA
- Phase Failure Relay — Crompton instruments
- Primary Power Line surge suppression Merlin Gerin
- Off/Auto/Test Switches — Spring Return Test to Auto - Square D 3mm 9001K Series
- Reset Push Button — Square D 3mm 9001K Series
- High Level Timer Relays — Omron H3CA-A
- Cabinet Light
- Security Door Switch Relay
- Back Up Battery
- Engraved Labelling

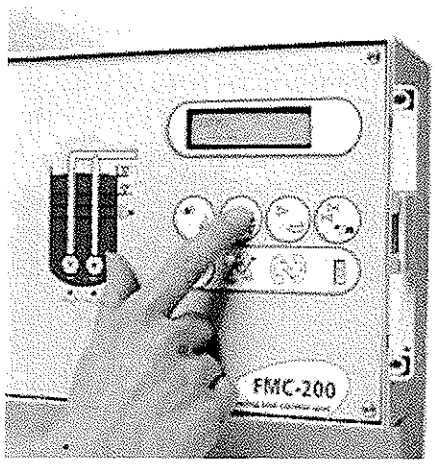
1.3 CONTROL PHILOSOPHY

A monitoring and control system is required for a pump network of three (3) pumps to be utilised to provide flushing water to the Darwin City Waterfront lagoon. The water level both in the lagoon and sea will have to be monitored to control the pumps so as not to flood the lagoon. The ITT Flygt Pump Management Panel will be used to control all three pumps based on feedback from both level sensors.

When the water level in the wharf open water area reaches a configurable start level (namely RL+2.5) the pumps will be called to start. When this level reaches a configurable stop level (namely RL+3.0) the pumps will stop. If, during this pumping cycle, the level in Lagoon area reaches a configurable stop level (namely RL+3.0) the pumps will stop and be inhibited from any further starts until the level returns to below the Lagoon area start level (namely RL+2.9).

Due to the operating conditions of these pumps, they will be fitted with ITT Flygt Pump Memory Units and ITT Flygt Vibration Sensors. The Pump Management Panel shall communicate with these devices and also make this data available remotely. See the sections below for more detail.

1.4 PUMP MANAGEMENT PANEL – LOCAL INTERFACE



Set-points such as start and stop levels, alarm conditions and other operating parameters shall be easily entered and manipulated on site by the operator or appointed service provider using a local interface and display.

The operator will be capable of modifying the pump station operational parameters via this interface **WITHOUT the use of a laptop computer or any other external hardware device.**

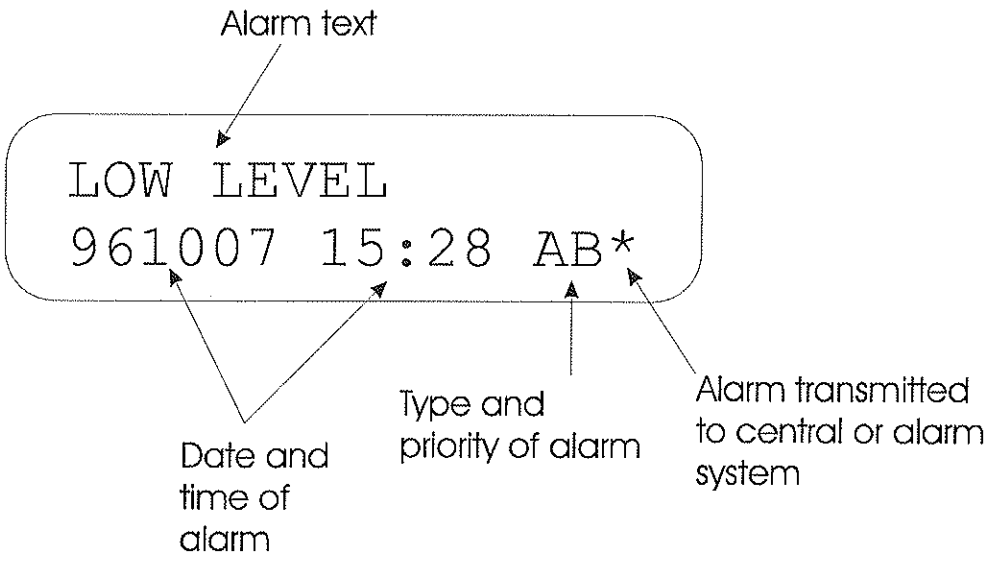
Alarms will be capable of being read and acknowledged via a display and key pad fitted to each control device.

1.5 FAULTS/ALARMS

The ITT Flygt Pump Management Panel will identify operational faults and acknowledges them as a malfunction, creating an audible and visual alarm.

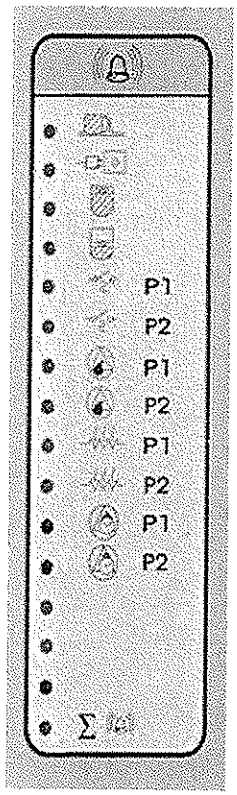
The ITT Flygt Pump Management Panel will be fitted with an alarm silencing push-button stop the alarm from unnecessary operation once the station operator has noted the fault.

The ITT Flygt Pump Management Panel will store the last 100 alarms in a FIFO (First in, First out) format, with the date and the hour of occurrence. The recording of the alarms are made in chronological order. Each stored alarm will be available for display at the local interface as below:



1.6 LOCAL ALARM INDICATION

The ITT Flygt Pump Management Panel will be equipped with low voltage non filament lamps (LED type lights) indicating the operational functions, the communication interactions and the alarms state.



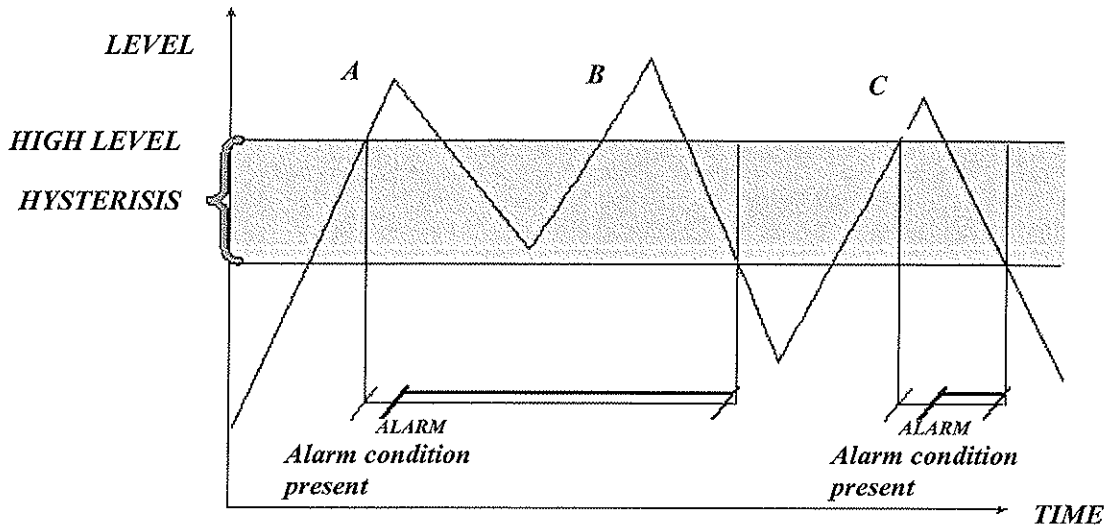
The ITT Flygt Pump Management Panel will allow for manual testing of the alarm and operating LED type lights by simulation of the alarms.

The appropriate indicator (LED or similar) will flash when an alarm is activated and will continue to flash until the alarm has been acknowledged with the acknowledgment button.

If the alarm remains active (the cause is still present when the alarm is acknowledged), the LED will display a steady beam. If the alarm becomes passive before it is acknowledged, the LED will continue to flash until acknowledgment is performed.

1.7 ALARM HYSTERISIS

The ITT Flygt Pump Management Panel will be configured with "Alarm Hysterisis" to filter out undesired, superfluous alarms. Hysterisis, will be applied to analogue alarm limits, and will specify the amount by which the measured value must change for an alarm to be deactivated. Hysterisis will be configurable by the operator or appointed service provider locally via the local interface or remotely via the Aquaview SCADA system.



In the above example, the High level alarm is subject to a limit. The Hysterisis range is shown by the shaded area. If an alarm occurs, the level must fall below the lower Hysterisis limit before it can be repeated. The alarm condition is fulfilled at point A, although the alarm itself is generated a little later since it is normally subject to a delay. The alarm will remain active while the level remains in the shaded, Hysterisis area. Thus, a new alarm is not generated at point B, even though the level has again risen above the high level limit, since it has not fallen below the lower Hysterisis limit in the interim. However, at point C, the alarm condition is again fulfilled and an alarm is generated after the specified delay.

Hysterisis will operate in similar manner for a Low level alarm. In this case, the level must exceed the upper Hysterisis limit before the alarm can be repeated.

The alarm Hysterisis will be selectable via the local interface or via the Aquaview SCADA system.

1.8 REQUIRED ALARMS

The following is a list of the alarms which will be recorded at the control panel and transmitted over the PSTN network, together with the associated time and date stamp, alarm codes, alarm priorities and alarm texts to the Aquaview SCADA and via SMS to the operator or appointed service provider. In the event of the Aquaview server not being able to be reached the FMC will forward an SMS to one additional number (ie. direct to personnel mobile phone).

Alarm Text	Description
High level	High level in the lagoon. Alarm from the analogue level input.
Low level	Low level in the lagoon. Alarm from the analogue level input.
Mains error	Site power has failed. The pumps are blocked.
High level reg.	High levels float. Starts the pumps. See also the "Hi level run" function in the pump control group.
Personal alarm	There are personnel in distress! Attend to immediately!
Tripped P1	Pump 1 current overload device has Tripped motor. The pump is blocked by this alarm.
Tripped P2	Pump 2 current overload device has Tripped motor.. The pump is blocked by this alarm.
Tripped P3	Pump 3 current overload device has Tripped motor.. The pump is blocked by this alarm.
High current P1	High current P1. Alarm from the analogue current input.
Low current P1	Low current P1. Alarm from the analogue current input.
High current P2	High current P2. Alarm from the analogue current input.
Low current P2	Low current P2. Alarm from the analogue current input.
High current P3	High current P3. Alarm from the analogue current input.
Low current P3	Low current P3. Alarm from the analogue current input.
Operation error P1	The RTU has called for the pump to start but has detected that pump has failed to start.
Operation error P2	The RTU has called for the pump to start but has detected that pump has failed to start.
Operation error P3	The RTU has called for the pump to start but has detected that pump has failed to start.
High temp P1	High temperatures pump 1.
High temp P2	High temperatures pump 2.
High temp P3	High temperatures pump 3.
Extremely high level	Very high level in the lagoon. Alarm from the analogue level input.
Extremely low level	Very low level in the lagoon. Alarm from the analogue level input.
Set point changed	At least one channel has been changed at the local display.
Power disturbance	The RTU has detected a power disturbance.
Interlock active	This RTU is receiving blocking signals by telephone from other RTU's.
Max starts P1	P1 starts too often. The value that is entered in the channel "Max start per hour" has been

	reached.
Max starts P2	P2 starts too often. The value that is entered in the channel "Max start per hour" has been reached.
Max starts P3	P3 starts too often. The value that is entered in the channel "Max start per hour" has been reached.
Sensor Fault	If the signal from the level sensor is less than 2,5mA or greater than 22 mA the alarm is triggered.
Service P1	P1 has reached the service interval value that has been entered. The pump needs service.
Service P2	P2 has reached the service interval value that has been entered. The pump needs service.
Service P3	P2 has reached the service interval value that has been entered. The pump needs service.
Low Water/Pump Fail	There is a low level in the lagoon, and 1 pump has failed.
Blocking	The blocking by telephone function is activated. This RTU is sending signals to other RTU's.
P1 Switch Off	The Site Auto/Manual/Off switch of pump 1 is set to "Off".
P2 Switch Off	The Site Auto/Manual/Off switch of pump 2 is set to "Off".
P3 Switch Off	The Site Auto/Manual/Off switch of pump 3 is set to "Off".
2 Pumps Failure	2 or more pumps have failed.
Test Call	The RTU has sent a test alarm to show that it is functioning normally.

1.9 ALARM PRIORITIES

Alarms will be capable of being appointed priority settings via the central system and local interface. Below shows an example of setting the priority for each of the above alarms.

- HIGH PRIORITY ALARMS
  - These alarms will be forwarded to the service personnel immediately regardless of the time of day or day of week.

- TYPICAL HIGH PRIORITY ALARMS:
  - High Level
  - Loss of power at site
  - Pump Failure

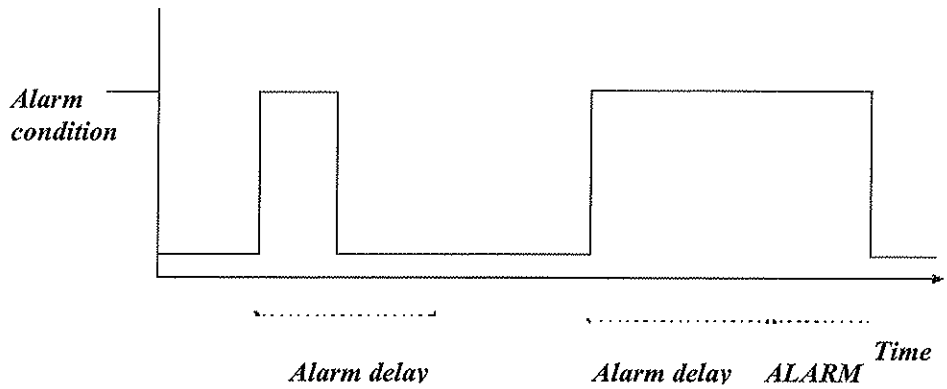
- MEDIUM PRIORITY ALARMS
  - These alarms will be forwarded to service personnel only during the normal working hours between the days of Monday and Friday.

- TYPICAL MEDIUM PRIORITY ALARMS
  - Pump has operated for designated time and now requires Servicing
  - Pump Oil Requires Changing

- LOW PRIORITY ALARMS
  - These alarms will be recorded and/or printed but not broadcast to service personnel.
  - Typical Low Priority Alarms
  - Test Alarms

ALARM DELAY

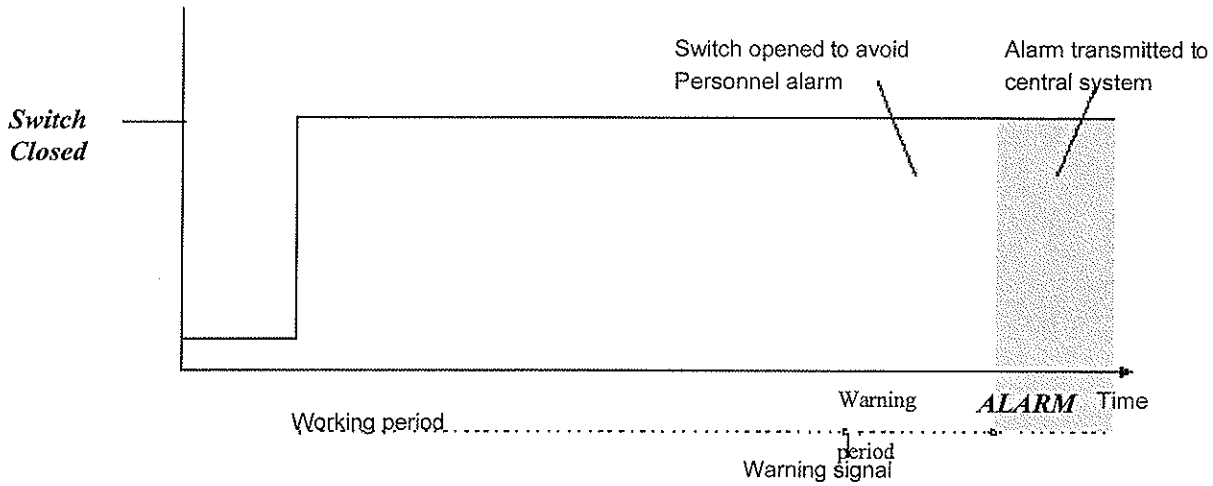
The Control panel will allow for the selection of an adjustable software time delay from zero to sixty seconds, during which an alarm has to be present in order for the alarm signal to be issued. This will avoid the signal of false alarms caused by erroneous measurements, or the transmission of these alarms to the service personnel.



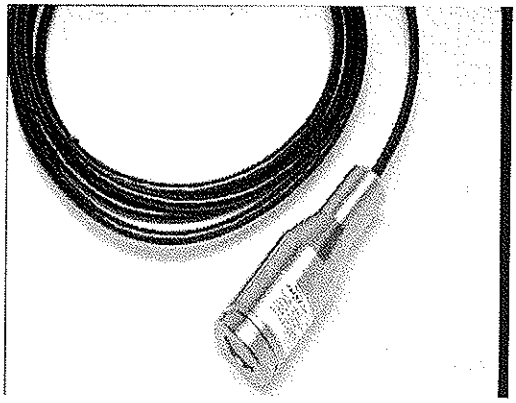
1.10 PERSONNEL ALARM

The control panel will indicate to the operator or appointed service provider when work is being carried out in the pumping station. A switch will be connected to the cubical door, and automatically operated when work is commenced in the station, starting a countdown to a specified working period. This work period (Maximum Work Time) will be adjustable for each site via the user interface or remotely via Aquaview SCADA system.

When the work period has elapsed, an audible warning device will then be activated for an adjustable time (Warning Time) period. Site service personnel must activate the door switch momentarily when the warning buzzer is heard, otherwise the alarm be forwarded to the central system to warn other staff that personnel at site require assistance.



1.11 ITT FLYGT LS100 PIEZOELECTRIC LEVEL SENSOR:



Both the Warf Open Water and Lagoon levels will be measured using an ITT Flygt LS100 piezoelectric analogue level sensor.

WARF OPEN WATER LEVEL:

An ITT Flygt LS100 will be installed in a specifically designed stilling tube, with a minimum internal diameter of 70mm, attached the pump mounting structure. The level sensor will measure the static pressure of the water present in Warf Open Water area, and provide an analogue 4-20mA signal to the ITT Flygt FMC400 pump controller.

This sensor will be cabled back to the ITT Flygt Pump Management Panel in a manner that ensures the accuracy, stability and repeatability of the sensor is maintained, this includes any signal amplifiers that may be necessary.

LAGOON WATER LEVEL:

An ITT Flygt LS100 will be installed in a specifically designed stilling tube, with a minimum internal diameter of 70mm, installed to an area of the lagoon in order to minimise the effect of wave action. The level sensor will measure the static pressure of the water present in Lagoon area, and provide an analogue 4-20mA signal to the ITT Flygt FMC400 pump controller.

Level sensors will be provided with atmospheric compensation, removing the need for Zero Calibration

The specifications of the ITT Flygt LS100 sensor are as follows:

- **Power supply:** *10–30 V DC, two-wire system*
- **Output signal:** *4–20 mA*
- **Max load resistance:** *R = 50x (supply voltage –10V) Ω*
- **Media temperature:** *–20°C – 80°C (max +90°C for non Ex-applications)*
- **Inaccuracy:** **±0,1% of total range incl. non-linearity, Hysterisis and repeatability**
- **Long term drift:** **±0,1% of total range over 6 months**
- **Temperature drift:** *±0,015% of total range per °C*
- **Position dependent** *No*
- **Sensor Material:** *Ceramic*
- **Sensor housing:** *316 stainless steel*
- **'O-ring:** *Viton*
- **Cable:** *Polyurethane vented, minimum bend radius 80 mm*
- **Ingress protection:** *IP68 (120 m H2O)*
- **Intrinsic safety approval:** *CENELEC EEx ia IIB T4*

Due to local conditions, moisture content, water temperature, surface instability, marine environment, other sensors are not acceptable.

1.12 PUMP CONTROL LOGIC

Each control panel will operate all pumps located at each pumping station, as per the following:

Level sensor 1 (Wharf Open Water): Start & stop the pump(s) after user configurable delay

Level Sensor 1 (Wharf Open Water): Indicate low, low low, high and high high level

Level sensor 2 (Lagoon): Start & stop the pump(s) after user configurable delay

Level Sensor 2 (Lagoon): Indicate low, low low, high and high high level

Float 1: Indication of a high level alarm and automatic blocking of pump(s)

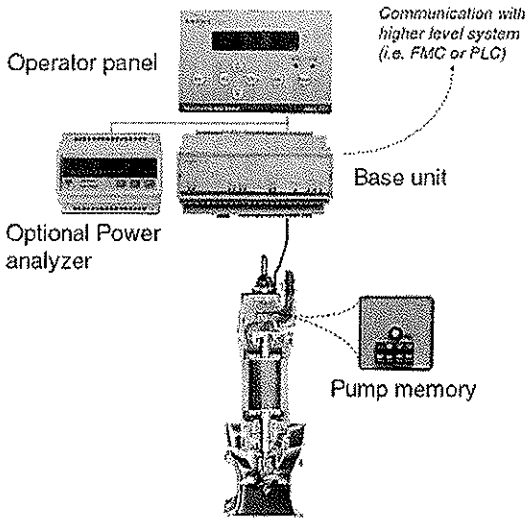
1.13 PUMP START PROCEDURE

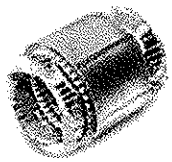
When the level sensor records the adjustable start level, the control panel, will:

1. Start the pump according pump start sequence (one at a time with user configurable delay between starts)
2. Monitor Motor Circuit Breaker/Overload + SMS alarm breaker faults
3. Monitor Motor Contact Closure + SMS alarm any contactor Fault
4. Monitor Pump Current + SMS alarm abnormal current & Stop pump to clear blockage
5. Allow pump to operate ONLY if all of the above conditions are determined as normal, and continue pumping until the level sensor stop condition is met.
6. Stop the pump should the PUMP CURRENT be determined to be abnormal and:
    a. Prevent the pump from operating for a period sufficient to allow the pump to clear any blockage.
    b. The control will then operate the pump again following the above testing procedures 2 to 5, stopping the pump a maximum of Five (5) times.
    c. After 5 attempts to clear a "blocked" pump, the control panel will "disable" the pump from further operation until the error condition is corrected.
    d. Generate an SMS alarm to the operator when a pump controller has determined a pump as "blocked".
    e. Prevent starting of a faulty pump until the operator clear the pump block condition, locally or via Aquaview SCADA system.

1.14 PUMP CONDITION MONITORING

Each control cubicle will be fitted with three (1 per pump circuit) ITT Flygt MAS711 supervision relays to monitor ITT Flygt Submersible Pump temperature and Mechanical Seal Leakage of fluid leakage into the pump housing.







Each control panel will interface directly with the ITT Flygt MAS711 supervision relay to enable full Aquaview SCADA ability.

Pump condition faults (See below) detected by the ITT Flygt MAS711 pump supervision relay will be recorded/stored at the pump controller and forwarded by the Aquaview SCADA system as an SMS to alert authorised operators or appointed service provider.

The following sensors will be mounted in each pump and will be required to be interfaced back to the ITT Flygt Pump Management Panel:

Sensor/component
FLS – Leakage in stator housing
Pt100 – Temp measurement, main bearing
Thermal switches – Temp guard, stator windings
FLS – Leakage in connection housing
Pump memory
Pt100 – Temp measurement, stator winding 1
Pt100 – Temp measurement, stator winding 2
Pt100 – Temp measurement, stator winding 3
Pt100 – Temp measurement, support bearing
CLS – Leakage in oil housing,
VIS10 – Vibration sensor,

The ITT Flygt Pump Management Panel will be configured to generate an alarm and/or trip the pump if any of the above sensors indicate a value outside of the desired operating conditions.

1.15 PUMP MEMORY UNIT

The pump memory is an electronic unit mounted in the pump top, containing unique data about the particular pump it is fitted in. By keeping records *in the pump*, data cannot be lost or corrupted along the way when the pump is serviced or moved. The information is used to simplify installation, service and maintenance of the pump and the MAS monitoring system.

The pump memory contains a microprocessor, which handles data exchange with the internal EEPROM (a so-called non volatile memory) and serial communication via the RS-485/Modbus with the Base unit. There is a temperature sensor on the circuit board, which can be used to protect the electronics from overheating.

1.16 PUMP MEMORY CONTENTS

1. *Data plate information, a fix and an editable part*
   The data plate fixed on the pump often cannot be seen/read due to the location of the pump. MAS enables the user to access data plate information via the FMC400: serial number, pump current, curve number, weight etc. Modifications to the pump and its rating can be written to the memory.

2. *Pump sensor configuration and settings*
   Information about the actual set of sensors mounted in the pump is downloaded during pump assembly along with default alarm settings. This configuration can be uploaded to the Base unit installation. This saves time and ensures safe operation of the pump at startup. Later, the user may adjust the settings and store them in the memory.

3. *Running statistics*
   Running statistics can be used at daily attendance to determine the pump's status by comparing current data with historical data. Running statistics comprise:

   - Histograms of all measured temperatures, vibration data and pump running time.
   - Start and stop registrations
   - Number of starts
   - Accumulated running time

4. *Service notes*
   There is a narrow memory area (200 lines of text) for the user's own notes about service measures etc.

1.17 Pump memory UNIT synchronization and backup

The Base unit will perform all measurements and data processing in the system. A subset of all data will also be stored in the pump memory. Updated measurement results, parameters or text are first stored in the Base unit and then copied to the pump memory. An automatic synchronization between the Base unit and Pump memory will takes\ place every second hour. This is the highest possible update frequency given the limitation of number of write operations over the life of the memory (EEPROM).

It shall be possible to manually write all data from the Base unit to the Pump memory or vice versa called manual synchronization.

1.18 CIRCUIT BREAKER STATUS MONITORING

Control panel will monitor the status of each individual pump motor circuit breaker. The operator or appointed service provider can view the status of these devices via the Aquaview SCADA system. A "tripped" circuit breaker will be recorded at the control panel and immediately forwarded to the Aquaview SCADA central system and the operator or appointed service provider via SMS paging.

1.19 PUMP CONTACTOR STATUS MONITORING

Control panel will monitor the status of each individual pump contactor. An authorised operator or appointed service provider can view the status of these devices via the Aquaview SCADA system. A "tripped" circuit breaker will be recorded at the control panel and immediately forwarded to the Aquaview SCADA central system and the operator or appointed service provider via SMS paging.

1.20 REMOTE PUMP OPERATION

Control cabinet will be capable of being remote controlled by authorised users via Aquaview SCADA system.

If a pump is remotely started or stopped via the Aquaview SCADA system, it will remain in that state during the time period nominated in an adjustable pump controller parameter. After a remote pump operation (via Aquaview SCADA), the control panel will be configurable if required to stop both pumps when the stop level is reached after. The pump control will then return to "Automatic" mode.

1.21 MANUAL PUMP OPERATION

The control panel will permit manual operation of the pump station by an operator on site, or remotely via the Aquaview SCADA system.

Control panels will be fitted with Off/Auto/Test switches fitted with spring return to automatically bring the switch back from the "Test" position to the "Auto" position once released. This will prevent the pump from being excessively run manually, preventing the pump from running dry, reducing pump damage and possible pump failure.

The control panel will detect if the Off/Auto/Test switch is held in the test position for more than 5 seconds and automatically operate the required pump/s. After the switch is released, the control panel will continue the pumping operation/s until the pump stop condition is reached.

1.22 SWITCH POSITION TRANSMISSION

The position of the Manual/Off/Auto switch will be transmitted to the Aquaview SCADA system and will be available for viewing by the operator or authorised user/s via the Aquaview SCADA system.

1.23 PUMP SELECTOR SWITCHES LEFT IN OFF POSITION

The control panel will automatically detect when the cubicle door is closed and one or more of the Off/Auto/Test switches have been left in the Off Position. This event will create an immediate alarm and via the Aquaview SCADA system, send an SMS alarm to appointed representative.

1.24 START UP AFTER POWER FAIL

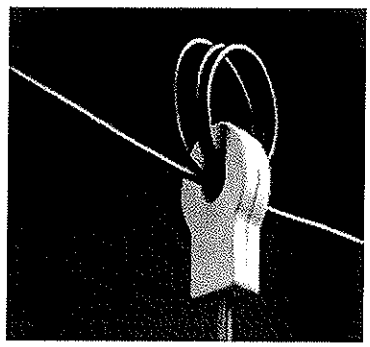
The control panel will, following a power failure, provide a user adjustable software time delay from zero to three hundred seconds, during which no pump can start up. This prevents high inrush current, which would result if numerous pumps were started at the same time, after a power failure and possible high level that would result from a power interruption.

1.25 START/STOP DELAYS

The pump controller will control the starting, stopping and, if necessary, alternation of the pumps. An adjustable software time delay from zero to fifty seconds, before the starting of a pump will be configurable to prevent the high inrush current, which would result if numerous pumps were started at the same time. This setting will be user adjustable by authorised users via the local interface and remotely via the Aquaview SCADA system.

1.26 PUMP CURRENT CONSUMPTION

The control panel will monitor each individual pump current consumption and display this figure via the local interface. Pump current will be averaged and recorded at 1 minute trend intervals and transmitted to the Aquaview SCADA system for use by the operated and/or authorised users.



Current consumption is vital in determining the condition of a pump and or impeller. Low current can be the result of a blocked check valve or worn impeller. High current can be caused by a broken discharge pipe/s.

Control panels will allow the operator or appointed service provider to set (locally via interface or remotely via Aquaview SCADA system) each individual pump an upper and lower current limit (to be determined by the operator or appointed service provider). Control panels will submit alarms to the Aquaview SCADA system and activate an SMS alarm if the measured pump current deviates from the minimum and the maximum limits.

Current trending (Graphical and Report form) will be available via the Aquaview SCADA system for use in conjunction with pump flow rates, discharge pipe pressure and pump times to allow the operator or appointed service provider to determine:

- Blocked impeller
- Blocked Check Valve
- Open Check Valve
- Worn Impeller
- Broken Discharge Pipe

1.27 PUMP SERVICE INTERVAL

The control panel will be capable of being configured with a service alarm which is activated after the pumps have been in service for a number of hours. Control cabinet will generate an alarm to Aquaview SCADA system and then via SMS to an authorised operator or appointed service provider when each submersible pump is due for service. The interval of this alarm will be configurable via the local display or via the Aquaview SCADA system.

After the timer has elapsed, the control panel will record the operation hours the pump has run since the suggested service interval.

The Aquaview SCADA system will log and record:

- Operation time since pumps were last serviced
- Operation time since pumps were due to be serviced

1.28 HISTORICAL TREND DATA

The control panel will perform sampling at 10hz of the following analogue trend data and store these parameters at 1 minute averaged intervals for up to fifteen (15) days. This data will be sent to the Aquaview SCADA system for storage at 1 minute trend intervals for use by an authorised user and appointed service provider as required.

- Relative Level in Warf Open Water
- Relative Level in Lagoon
- Vibration for Pump 1
- Vibration for Pump 2
- Vibration for Pump 3
- Current for Pump 1
- Current for Pump 2
- Current for Pump 3
- Counter value / 5 min
- Counter value / 24 hours

The present value of each of the above parameters will be displayed via the local interface.

1.29 STATISTICAL DATA

The control cabinets will sample, calculate and summarize the following statistics.

- Running time pump 1
- Running time pump 2
- Running time pump 3
- Number of starts pump 1
- Number of starts pump 2
- Number of starts pump 3
- Total running time pump 1
- Total running time pump 2
- Total running time pump 3
- Rainfall
- Number of blockings
- Used energy, calculated
- Time since pump service due

This collected data will be capable of being displayed locally using the local interface and will be transferred to the Aquaview SCADA system for viewing and manipulation by an authorised user and appointed service provider.

1.30 SETUP & COMMISSIONING

All user configurable parameters (start levels, stop levels, current limits etc...) will be capable of being manipulated locally via the local interface whilst the pump controller is functioning and controlling a pump station, without interrupting its operation, trending and Aquaview SCADA functions.

These parameters are capable of being entered using the local display or via remote location by an authorized user via the Aquaview SCADA system

1.31 REAL TIME CLOCK

Control panel will be fitted with a real time clock safeguarded by an internal battery backup system to keep the time and date registration of all alarms, trend information and operation parameters in the event of power being interrupted for long periods.

1.32 BATTERY BACKUP

Each control panel will be fitted with a rechargeable battery back-up system allowing for the following operations to operate during site power failure situations.

- Continuous reading of the relative levels
- SMS alarm paging
- Local set-point adjustments
- Remote set-point adjustments via Aquaview SCADA system
- SCADA system operation

The battery back-up will provide approximately twenty four (24) hours of monitoring and operation during power failure.

1.33 CPU PROTECTION CIRCUIT (Power Failure)

Control panel will continuously monitor the voltage of the backup battery system and during power failure situations, prevent the batteries being depleted by disabling the pump controller when the backup battery voltage is detected as excessively low. The control panel will prevent the pump controller from cycling on and off, preventing possible damage to pump controller CPU. Control panel will not allow pump controller to further drain an already low battery until AC mains power is restored.

1.34 POWER FAILURE OPERATION

The control panel will automatically restart after a power failure and retain all set points and operating parameters that were present prior to the power failure.

1.35 INTERNAL MEMORY BATTERY

Control panel pump controller will be fitted with a memory system allowing recording of set points and operating values entered either at the device or remotely via the Aquaview SCADA system. The information will be protected by a Nickel Cadmium EPROM battery, even in case of power failure.

1.36 LIGHTNING PROTECTION

The control panel pump controller will be equipped with optically isolated inputs to minimize the instances of damage caused by nearby lightning strikes.

1.37 SURGE DIVERTOR

The control panel will be fitted with a power surge diverter to effectively divert any incoming power surges to earth.

1.38 ADDITIONAL DATA COLLECTION

Control panel will have the capacity to add additional sensors for future to monitor of water quality and other sensors.

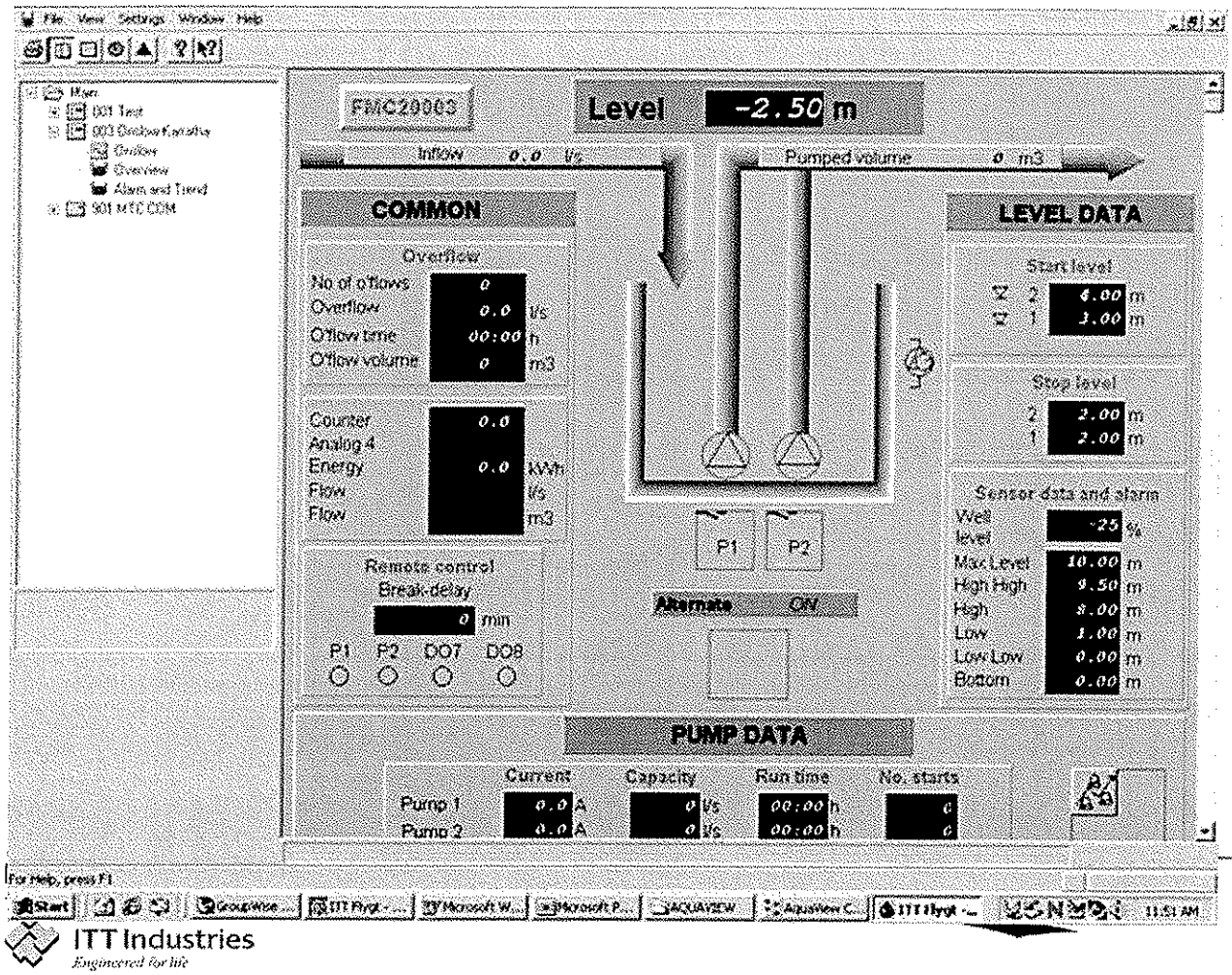
1.39 CONTROL PANEL PASSWORD PROTECTION

The control panel local interface will limit access to critical operating pumping parameters using a password.

2. Aquaview SCADA System

2.1 STATUS PICTURE

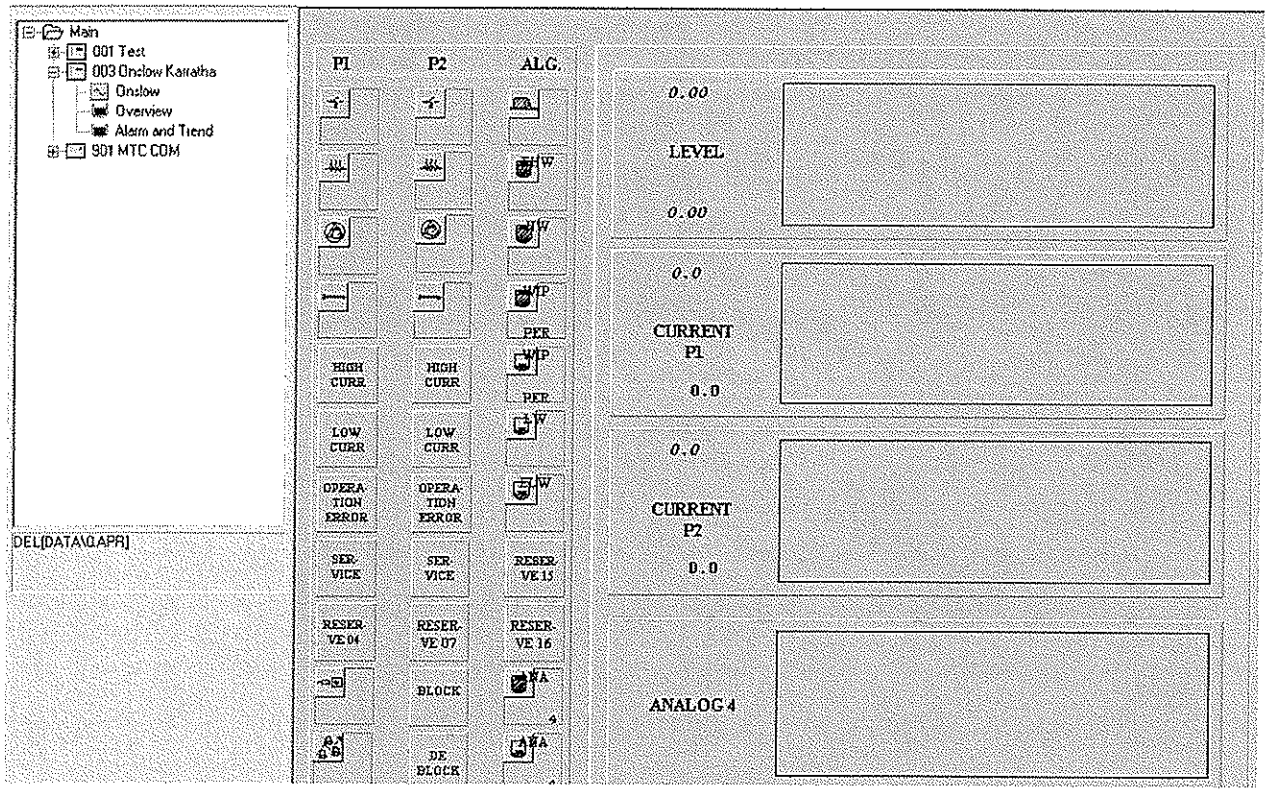
The ITT Flygt Aquaview SCADA server will provide the operator with the ability to view "real time" status pictures of each SPS site via the internet as required.



The status picture of the SPS will display:

Relative Level 1(M)	Analogue 4 (Relative Level 2 (M))	Level - Graphical	Remote Control
Starts Pump 1	Starts Pump 2	Starts Pump 3	
Runtime Pump 1	Runtime Pump 2	Runtime Pump 3	
Current Pump 1	Current Pump 2	Current Pump 3	
Pump 1 Running	Pump 2 Running	Pump 3 Running	
Start Level	Stop Level		
High High Level	High Level	Low Level	Low Low Level

2.2 ALARM PICTURE



The Aquaview SCADA server will provide real time indication of all alarms (Listed Previously) present at each SPS site including

Circuit Breaker P1 Tripped	High Level	High Current Pump 1
Circuit Breaker P2 Tripped	High High Level	High Current Pump 2
Circuit Breaker P3 Tripped	Low Level	High Current Pump 3
Power Fail	Low Low Level	Low Current Pump 1
Pump 1 High Temperature	High Level Switch	Low Current Pump 2

Pump 2 High Temperature	Pumps Remotely Blocked	Low Current Pump 3
Pump 3 High Temperature	Spare Alarm	Pump 1 Requires Service
Pump 1 Seal Leakage (Int Sensor)	Spare Alarm	Pump 2 Requires Service
Pump 2 Seal Leakage (Int Sensor)	Pump 1 Excessive Vibration	Pump 3 Requires Service
Pump 3 Seal Leakage (Int Sensor)	Pump 2 Excessive Vibration	
	Pump 3 Excessive Vibration	

The Aquaview SCADA system will also provide real time trending of:

- Warf Open Water Level
- Lagoon Water Level
- Current Pump 1
- Current Pump 2
- Current Pump 3

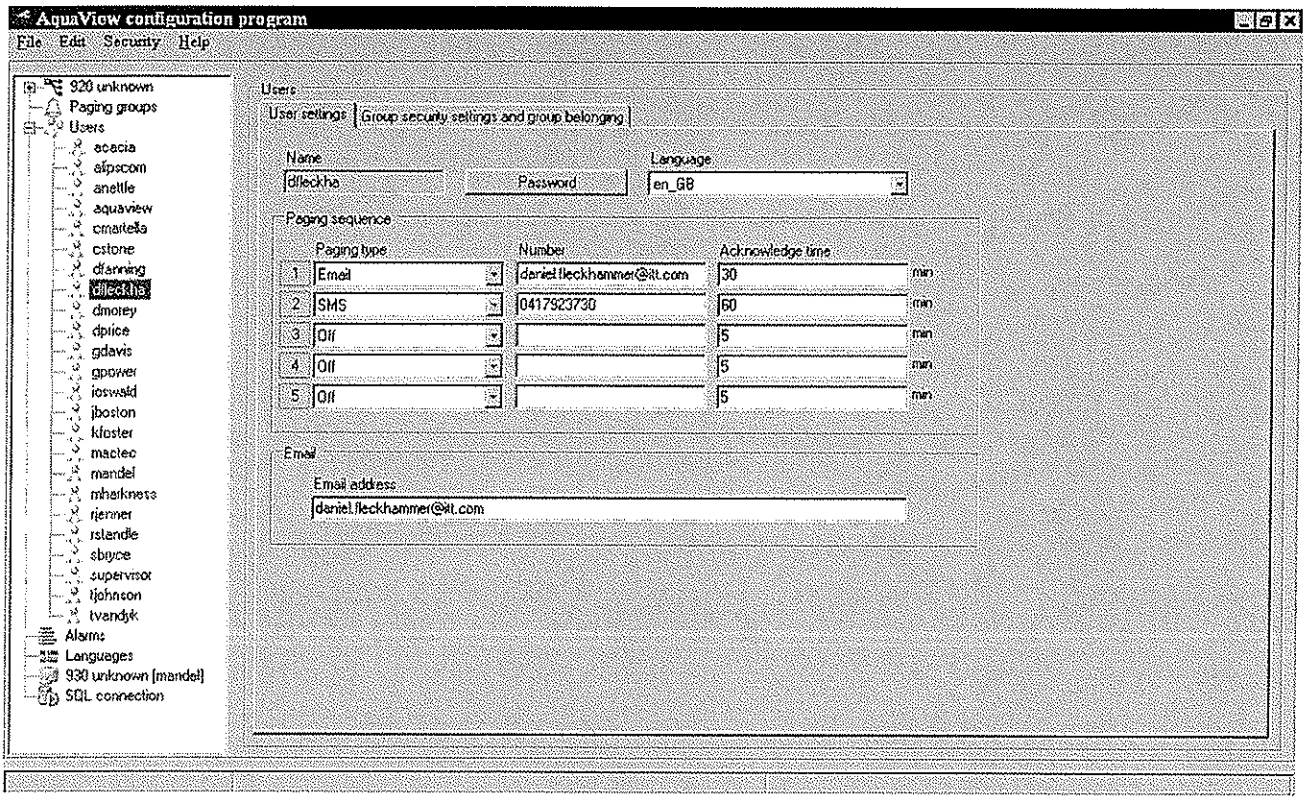
2.3 ALARM COLLECTION

Our ITT Flygt central Aquaview SCADA server will retrieve/accept SPS Generated alarms via SMS and store these alarms onto our server. These alarms can be accessed using the ITT Flygt Aquaview Server via the internet

2.4 AQUAVIEW SMS Alarm Management

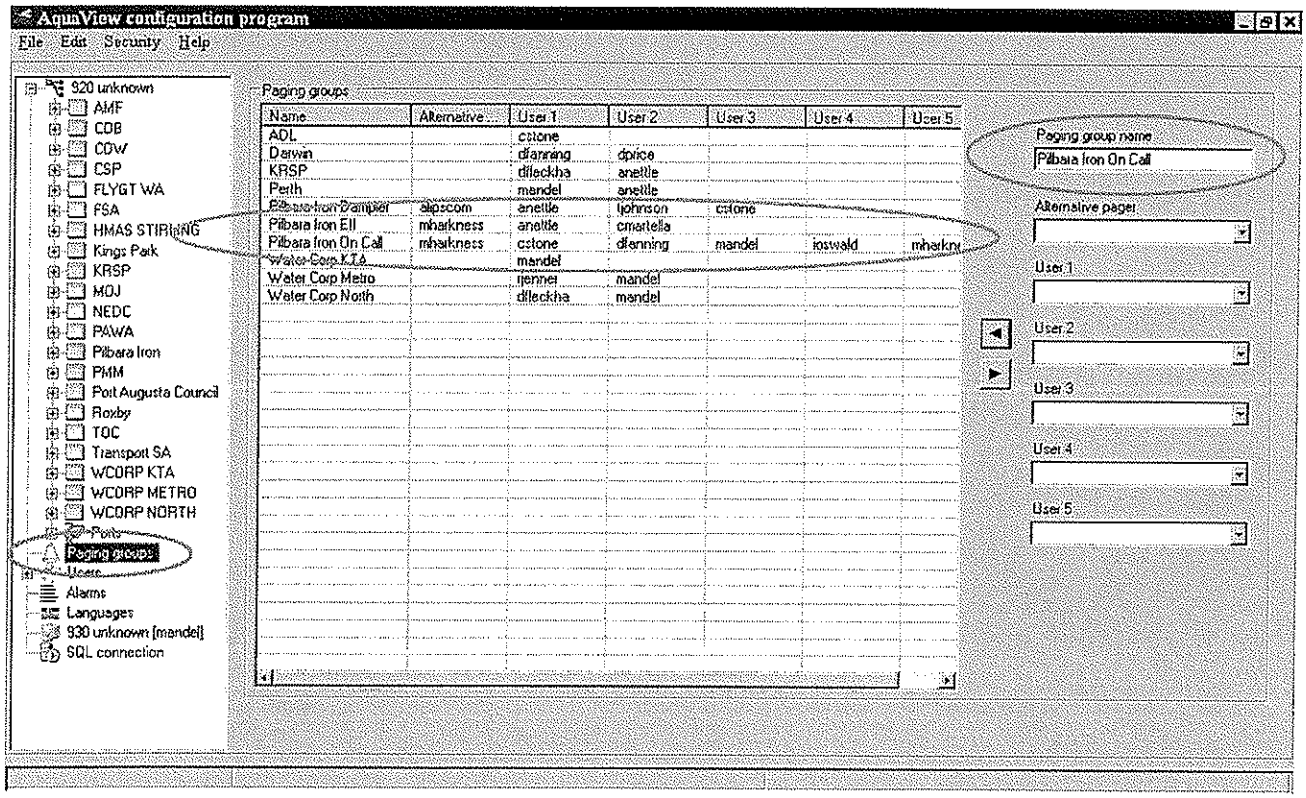
Please find below typical alarm distribution groups available in the ITT Flygt Aquaview Software.

Each user can be assigned an email address and an SMS address as shown below:

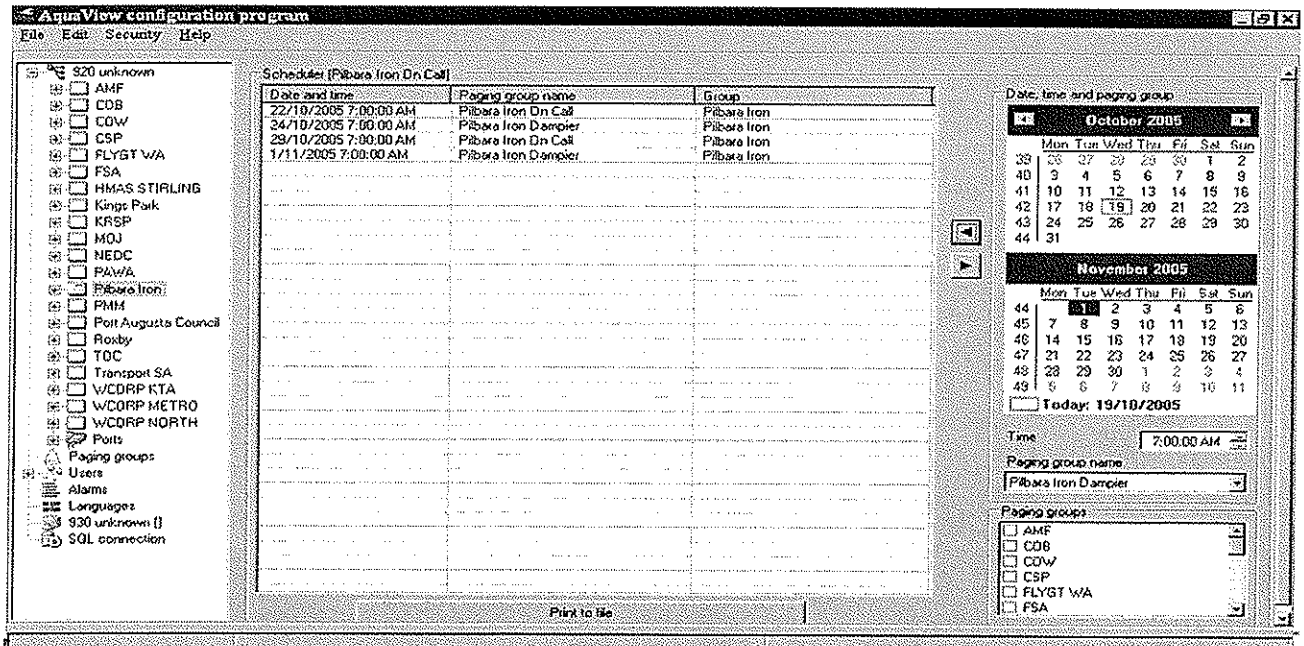

AquaView configuration program
File Edit Security Help
926 unknown
Paging groups
Users
acacia
alpscom
anettle
aquaview
cmartella
cstone
dfanning
dfleckha
dmorey
dprice
gdavis
gpower
ioswald
jboston
kfoster
mactec
mandel
mharkness
rjenner
rstandle
sbryce
supervisor
tjohnson
tvandyk
Alarms
Languages
930 unknown [mandel]
SQL connection
Users
User settings
Group security settings and group belonging
Name
dfleckha
Password
Language
en_GB
Paging sequence
Paging type
Number
Acknowledge time
1 Email daniel.fleckhammer@tt.com 30 min
2 SMS 0417923730 60 min
3 Off 5 min
4 Off 5 min
5 Off 5 min
Email
Email address
daniel.fleckhammer@tt.com

Groups of individuals can be set up into paging groups within our pump management server. Alarms will be forwarded via a combination of Email and/or SMS messaging services. The alarm is sent to the first "recipient" and after adjustable time period, forwarded to the next recipient and so on.

These groups can be easily amended for staff rotations, rosters and staff absence.



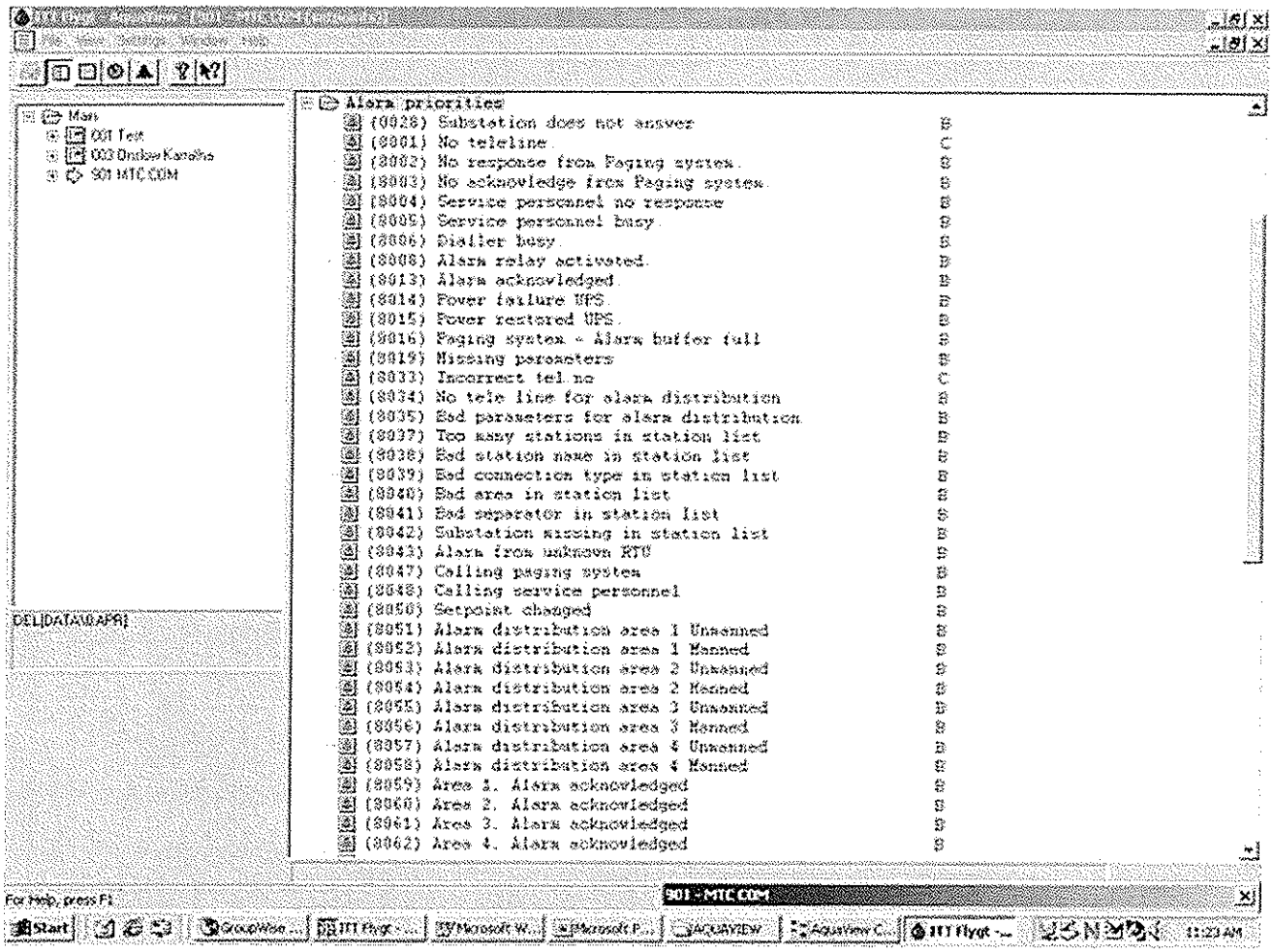
Each pump station or group of pump stations can be assigned different paging groups for different periods of the year, month, week and day. This means that different groups of assets can be managed by separate staff members.



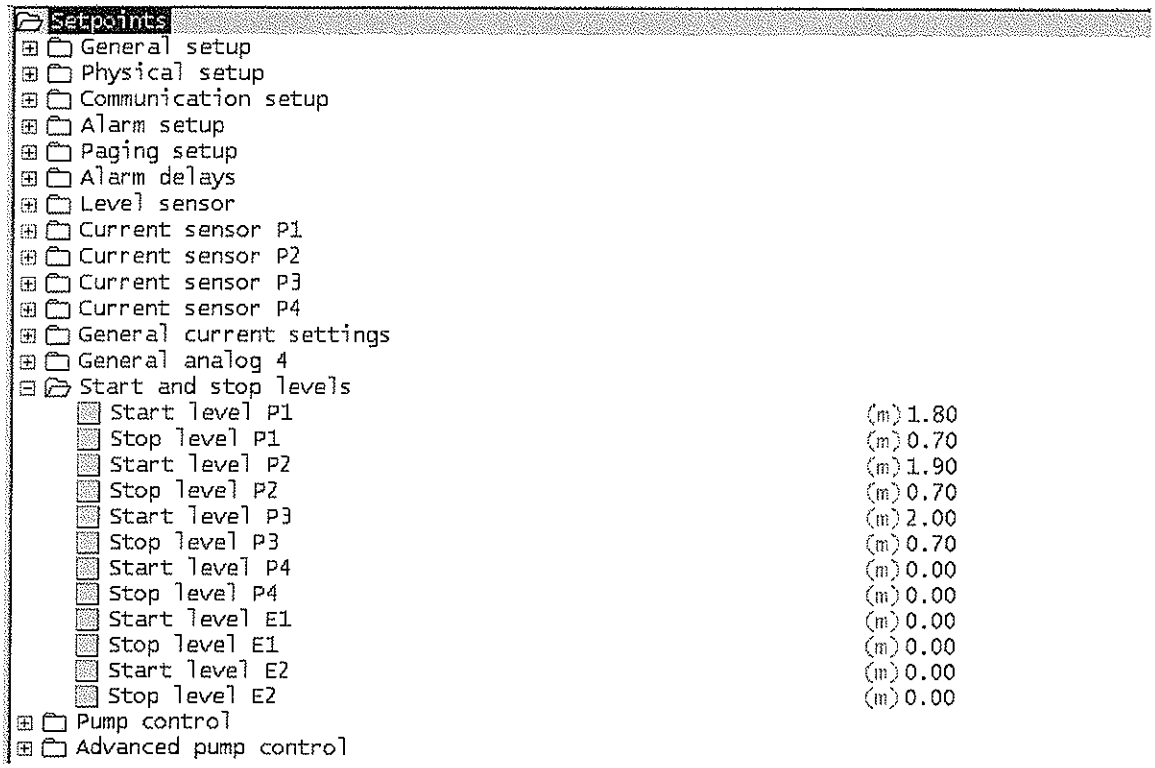
Flygt
ITT Industries
Engineered for life
CW-DC Pty Ltd

2.5 ALARM PRIORITIES

Each alarm described in the control panel description of this document will be configurable via the Aquaview SCADA software with a priority, allowing the operator and/or service provider to prioritize alarm actions and better schedule repairs and response. Alarm priorities will be made available by the Perth Aquaview SCADA server should the service agreement be accepted, otherwise adjustable from the FMC panel.



2.6 REMOTE SETPOINT ADJUSTMENT

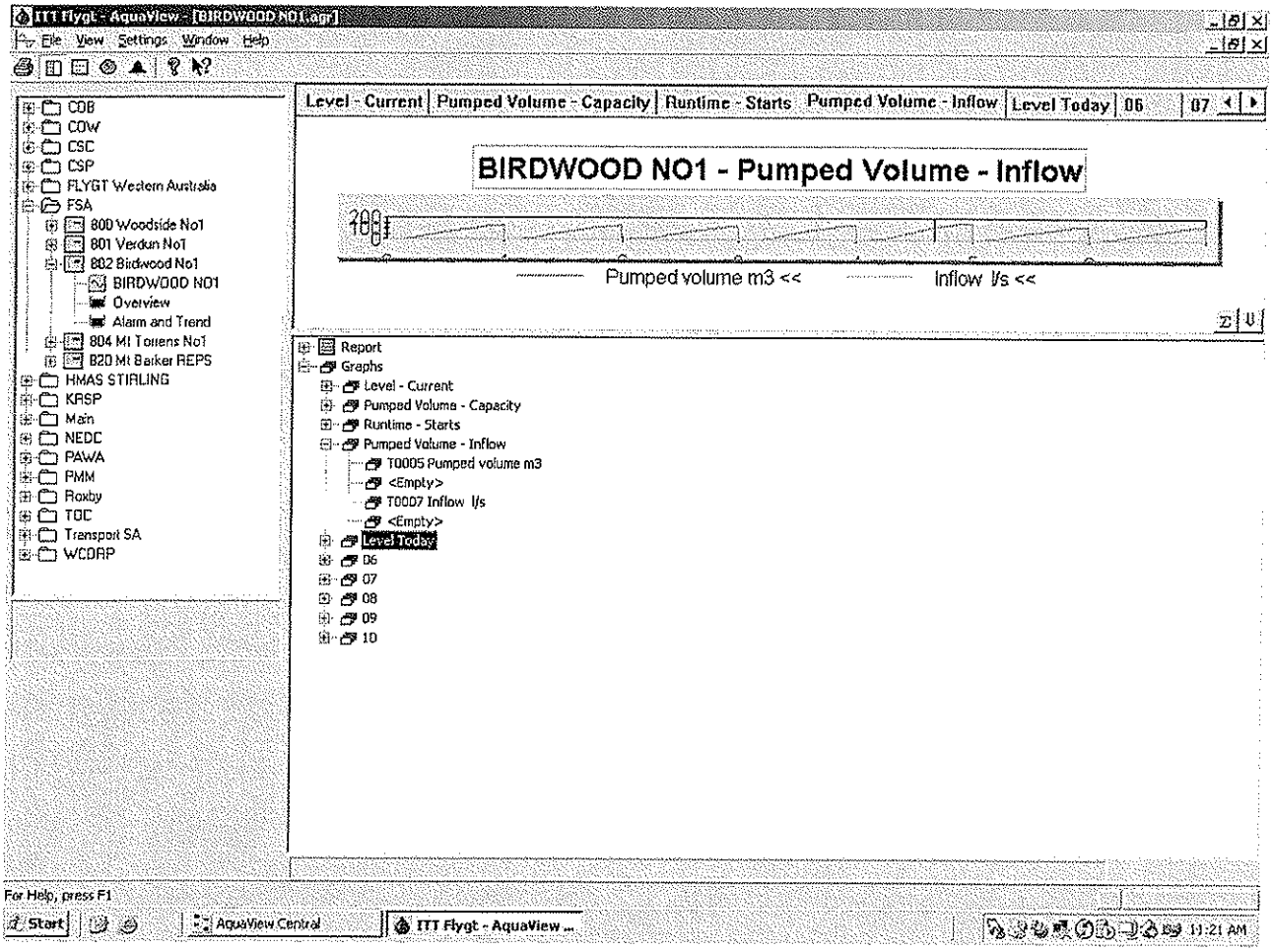


The Aquaview SCADA system will allow the operator or appointed service personnel retrieve and update all the necessary operational, control and measurement parameters, configurations and settings required to perform the necessary control cabinet tasks remotely. The set points will be made available by the Aquaview SCADA system in a manner allowing the operator to alter and manipulate directly using the Aquaview SCADA software, with no additional engineering assistance from another party.

3. TREND/GRAPHS

The proposed Aquaview SCADA software will allow the operator or appointed service personnel to create custom graphs including any parameter monitored by the Aquaview SCADA system.

SCADA system will allow the operator to simply select which site, inputs and/or sensors they wish to be included in a graph and the graph will be created in a matter of seconds, with no engineering or external assistance from a third party.

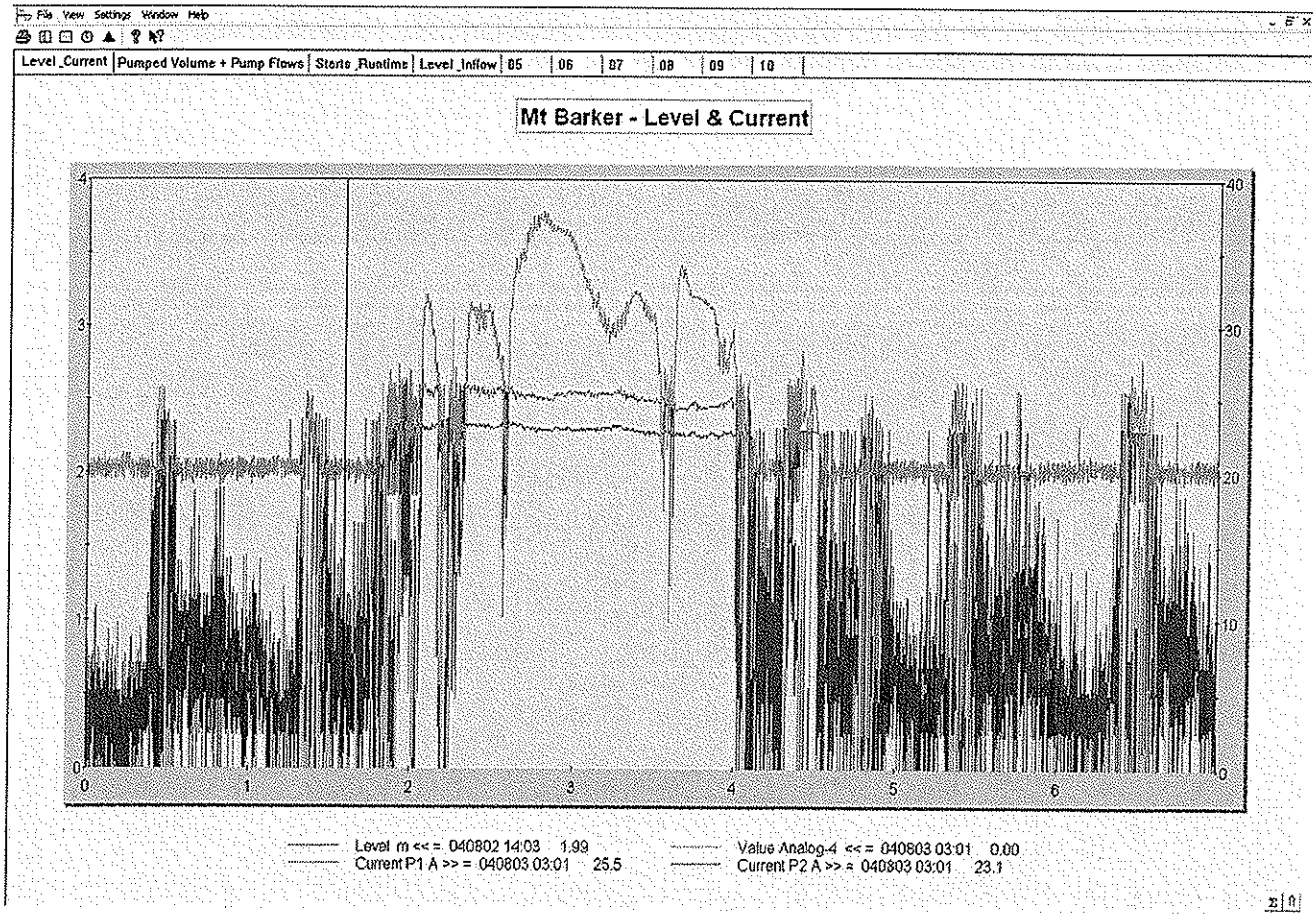


3.1 TREND/GRAPH DISPLAY

The Aquaview SCADA server will allow the operator to select the duration of each "individual" graph including:

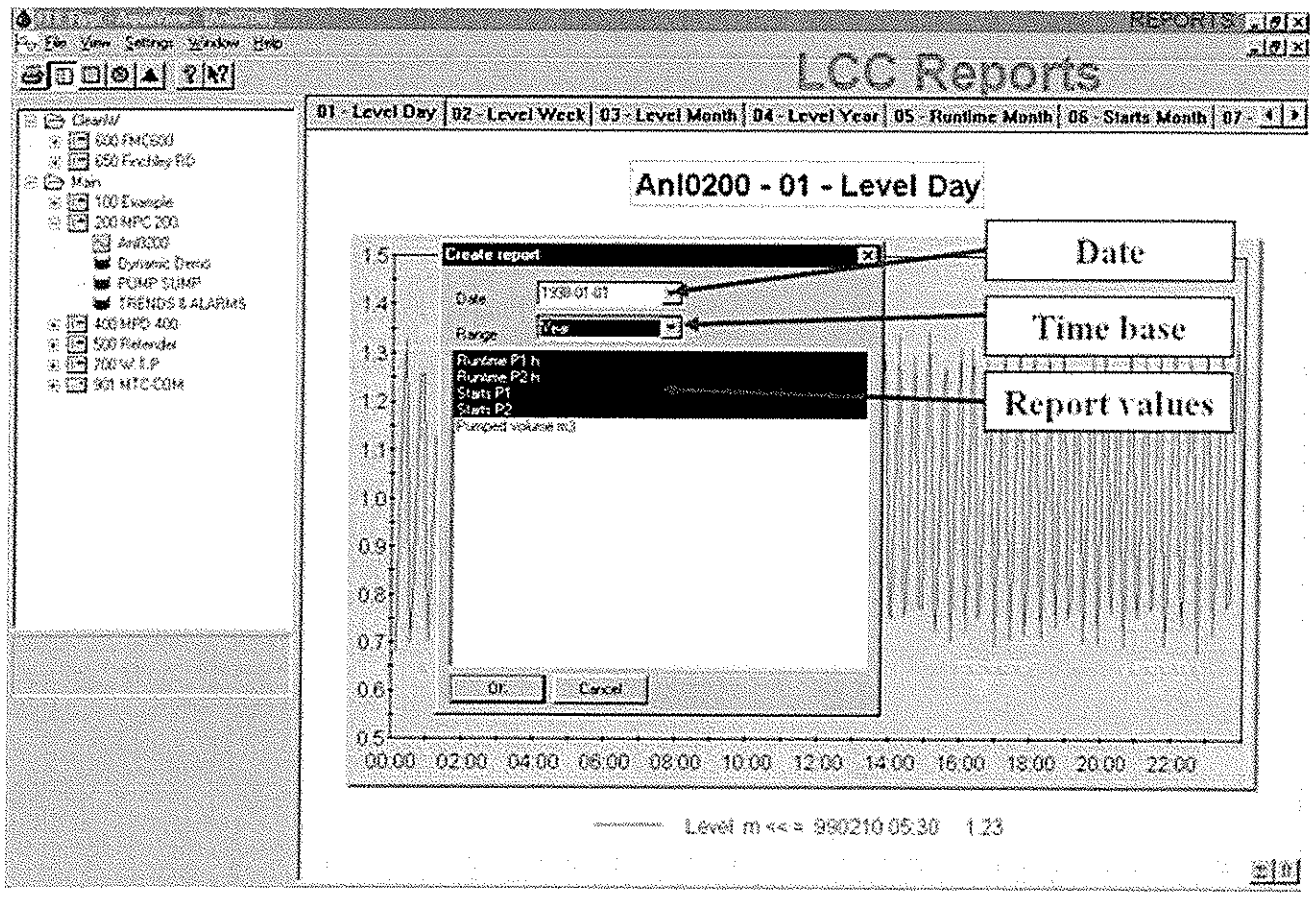
- Day
- Week
- Month
- Quarter
- Year

The Aquaview SCADA system will allow the operator to quickly "Zoom" into selected sections of a graph or trend display with the click of a PC mouse.



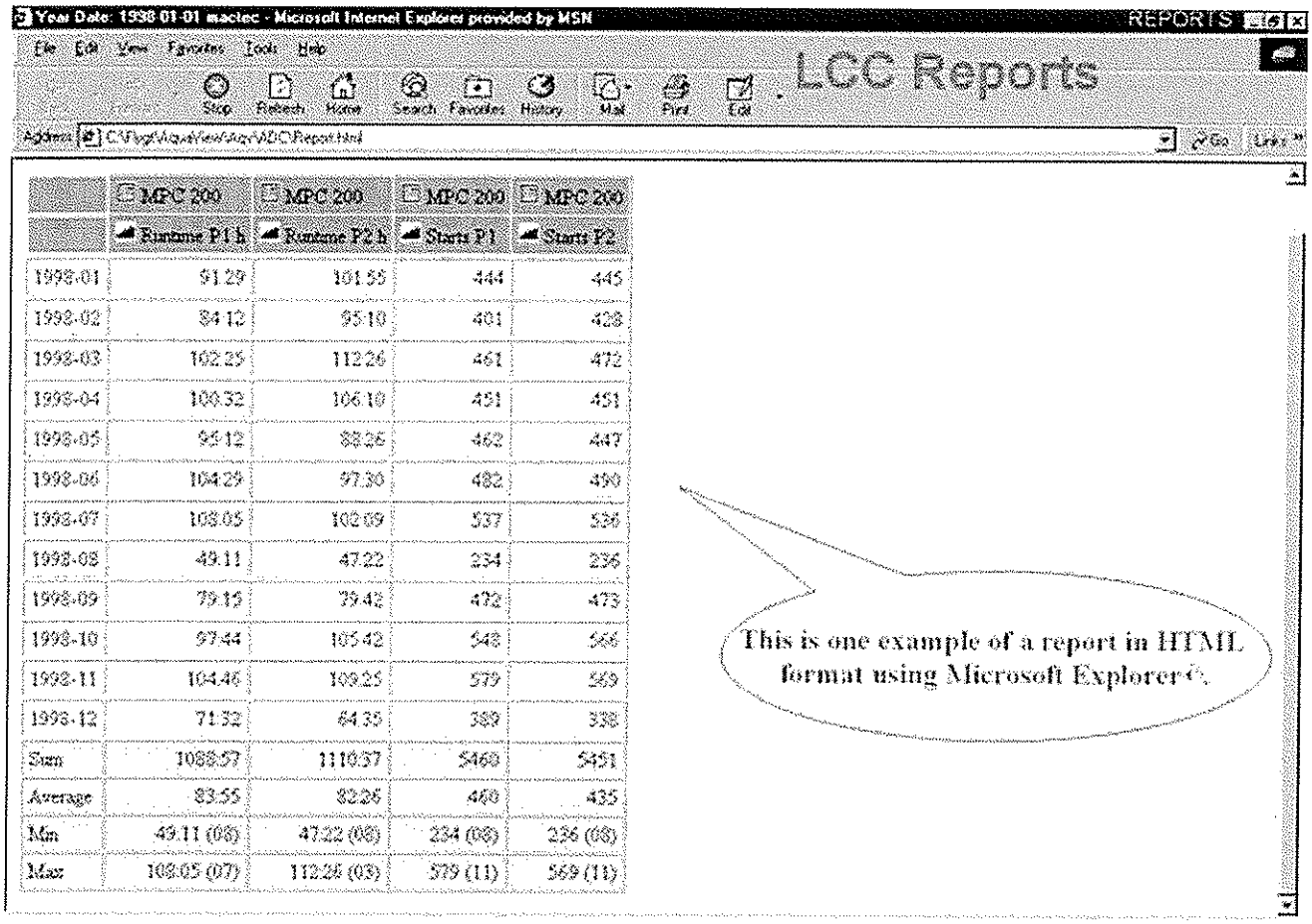
3.2 REPORT CREATION

The Aquaview SCADA software will allow an authorised operator or appointed service provider to create detailed operational reports in seconds. Aquaview SCADA users will be capable of simply selects a start date, a time base and what parameters are required in the report. Example is shown below.



3.3 REPORT DISPLAY

The report once created as described above, will then be capable of being displayed or exported in various formats including all DDE compatible applications, including but not limited to MS word, MS Excel, Access, Notepad, HTML etc…



	MPC 200	MPC 200	MPC 200	MPC 200
	Runtime P1 h	Runtime P2 h	Starts P1	Starts P2
1998-01	91.29	101.55	444	445
1998-02	84.12	95.10	401	428
1998-03	102.25	112.26	461	472
1998-04	100.32	106.10	451	451
1998-05	95.12	88.26	462	447
1998-06	104.29	97.30	482	490
1998-07	108.05	102.09	537	536
1998-08	49.11	47.22	234	236
1998-09	79.19	79.42	472	473
1998-10	97.44	105.42	548	566
1998-11	104.46	109.25	579	569
1998-12	71.52	64.35	389	338
Sum	1088.57	1110.57	5460	5451
Average	83.55	85.26	460	435
Min	49.11 (08)	47.22 (08)	234 (08)	236 (08)
Max	108.05 (07)	112.26 (03)	579 (11)	569 (11)

3.4 DATA ANALYSIS

The ITT Flygt Aquaview SCADA server software will allow an authorised operator or appointed service provider to perform rapid fault finding including the following. Graphs and data from various sites will be capable of being simply (Using a mouse and "simply" keystrokes) overlaid onto other sites for the purposes of fault finding and analysis of the pumping network.

3.5 FAULT DETECTION

The Aquaview SCADA system will allow an authorised operator or appointed service provider to combine and overlay (without the assistance of a third party or additional software or engineering) collected trends, reports and graphs of pump flow rates, pump currents, discharge pipe pressure, pump run times and pump starts to detect a broken discharge pipe that is allowing effluent to reach the environment.