Chillagoe Arsenic Filtration Plant

INTRODUCTION

Mareeba Shire Council engaged Amiad Water Systems to design, construct and commission a 6-10 L/s Arsenic Filtration Plant for the township of Chillagoe in far North Queensland. The town sources its water from a local bore field which suffers from Arsenic levels in the range of 0.010 – 0.020 mg/L; exceeding the Australian Drinking Water Guidelines. The contract specified that the plant must achieve a target level of Arsenic of less than 0.005 mg/L in the product water.

To achieve the target Amiad proposed a system of Chlorination, Ferric Chloride Dosing, DMI65 Catalytic Media Filtration and Cartridge Filter Polishing. The supplied plant is fully automatic and controlled by an Allen Bradley PLC with a Schneider PC / Touch Screen loaded with Citect Software, for local and remote operation.

TREATMENT PROCESS

Chlorination: In ground water, Arsenic occurs predominantly as arsenite As (III), and requires conversion to arsenate As (V) by chlorination to enhance the effectiveness of the filtration process. Chlorine also acts as catalyst for the DMI-65 media, and is required for its regeneration to re-establish the oxidizing environment on the surface of the media.

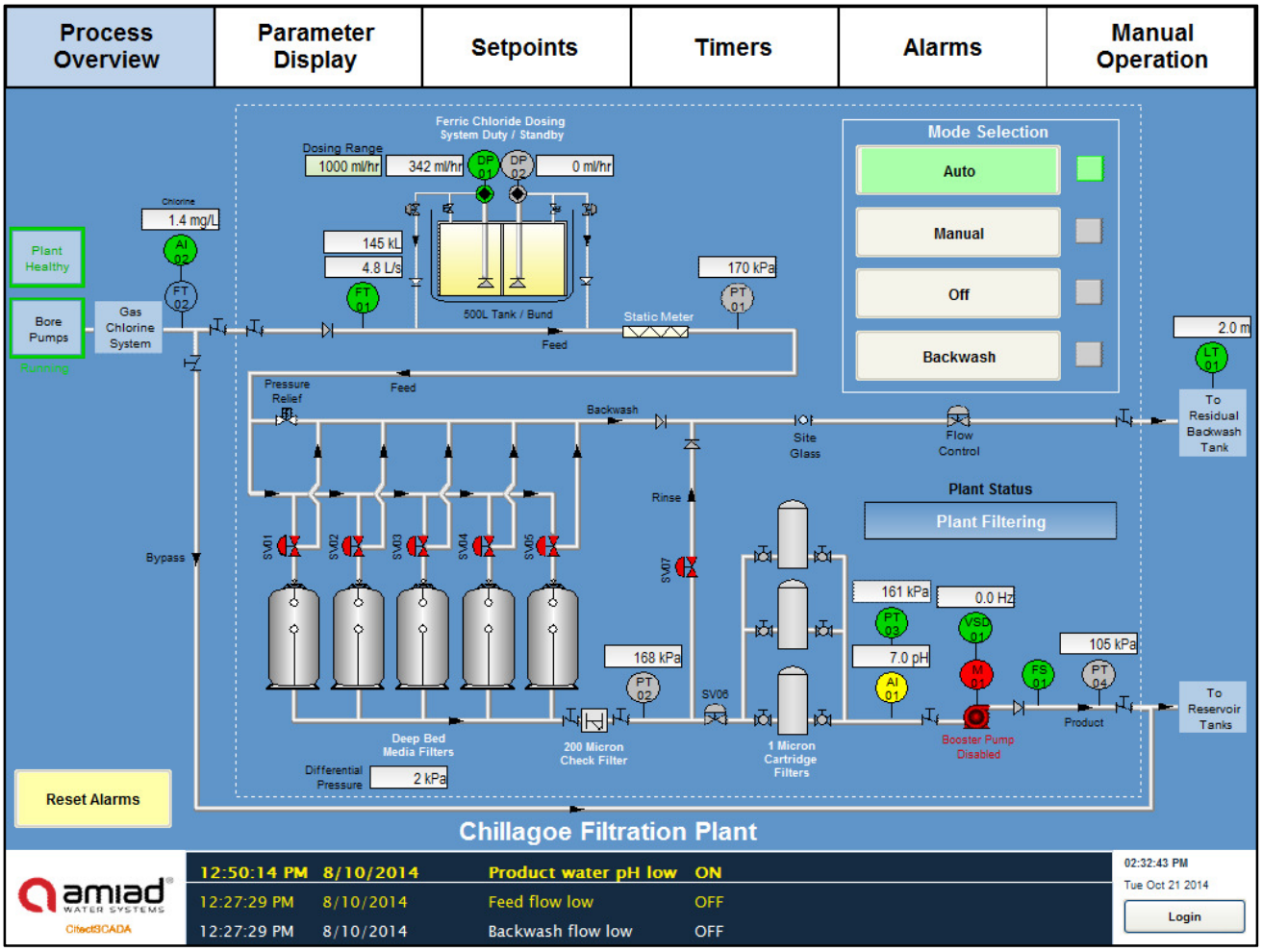
Ferric Chloride Dosing: Arsenic can bond with iron salts in the water and with metal based coagulants such as Ferric Chloride. Ferric Chloride is dosed such that there is a sufficient reservoir of iron for arsenic to form complexes and precipitants with the iron salts via the chemical processes of precipitation, co-precipitation and adsorption, which can then be filtered.

DMI65 Catalytic Media Filtration: DMI-65 is a manganese dioxide (MnO_2) infused media whose surface acts as a good oxidant and is effective in removing both arsenite and arsenate, as well as iron/arsenic complexes and precipitants. The DMI-65 Media Filters are periodically backwashed and rinsed based on either pressure differential across the media filters or on time, whichever occurs first.

Cartridge Filters: 1 micron cartridge filters were installed to polish the product water and provide a final barrier to the precipitated arsenic.

CONCLUSION

The Arsenic Filtration Plant, designed and constructed by Amiad utilizing DMI65 Media, was commissioned in March, 2015, and has been successfully reducing the Arsenic to 0.001 mg/L, making it suitable for consumption by the community of Chillagoe, Queensland.


Process Overview
Parameter Display
Setpoints
Timers
Alarms
Manual Operation
Ferric Chloride Dosing System Duty / Standby
Dosing Range
1000 ml/hr
342 ml/hr
0 ml/hr
DP 01
DP 02
Chlorine
1.4 mg/L
AI 02
Plant Healthy
Bore Pumps
Running
Gas Chlorine System
FT 02
145 kL
4.8 L/s
FT 01
500L Tank / Bund
Feed
Static Meter
170 kPa
PT 01
Mode Selection
Auto
Manual
Off
Backwash
2.0 m
LT 01
To Residual Backwash Tank
Pressure Relief
Feed
Backwash
Site Glass
Flow Control
Rinse
Plant Status
Plant Filtering
Bypass
SV01
SV02
SV03
SV04
SV05
SV07
SV06
161 kPa
PT 03
0.0 Hz
VSD 01
7.0 pH
AI 01
M 01
FS 01
105 kPa
PT 04
168 kPa
PT 02
Deep Bed Media Filters
200 Micron Check Filter
1 Micron Cartridge Filters
Booster Pump Disabled
Product
To Reservoir Tanks
Differential Pressure
2 kPa
Reset Alarms
Chillagoe Filtration Plant
amiad WATER SYSTEMS
CitectSCADA
12:50:14 PM 8/10/2014 Product water pH low ON
12:27:29 PM 8/10/2014 Feed flow low OFF
12:27:29 PM 8/10/2014 Backwash flow low OFF
02:32:43 PM
Tue Oct 21 2014
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