Waughter

AKTION CONSULTANCY

Volume 3 : Edition 2– Condition Assessment of WTP or WWTP *Mar 01, 2023*

Dear Water Warriors,

2 years back when I found S Srivastava reluctant to visit and see any plant, I was disappointed as I wished to see many plants.

Now, I understand WTP and WWTPs cannot be visited like gardens. We understand plants are engineering marvel and require a systematic study. The series activities of DQ, IQ, OQ, PQ help us identify good and gaps.

The issue of 'Waughter', let's understand "How to Study a Plant".

Nidhi Jain – Civil Engineer

What is Condition Assessment?

Any water or waste water project can be thoroughly investigated with respect to a set objective that could be:

1. Performance Assurance
2. Opex Reduction
3. Performance Improvement
4. Sustainability & De-risking.

And, an engineer can not start with later (say 4) without performing first 3 in sequential order.

In this world where Industry is moving towards expansion and new projects, a systematic condition assessment of existing facility provides opportunity to utilize existing facility to maximum extend as well as allows designers to focus on trouble areas during previous operations.

A systematic approach here thus is important as it's effect is on future planning for 15 years.

Plant Tour – Building Blocks

To simplify the understanding, we are now dealing with Ca only when we see equations. One can easily write the same with Mg and Na as indicated below.

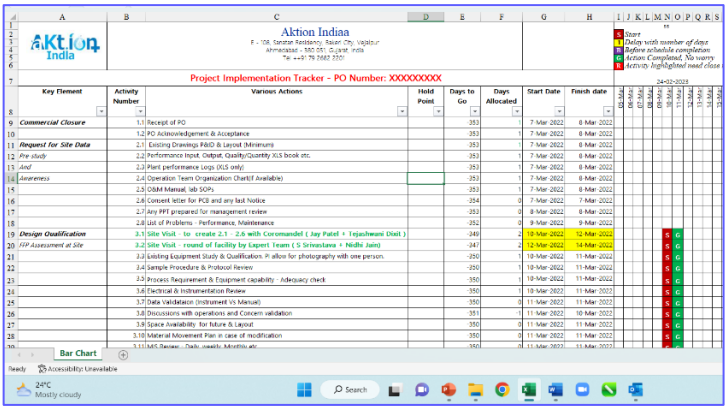
Process is as below:

1. Project Implementation Tracker
2. Existing Plant Documents (PFD, P&ID Etc.) Study
3. Documents Validation
4. Site Visit: Technical Validation
5. Draft Report:
6. Concern & Suggestion

Site visits must be with proper SHE compliance as well as permissions for photography or Videography.

Project Implementation Tracker

Planning every this as we say well begin is half done!



It is a project management tool, which is used to track the progress of agreed tasks in a project. By tracking our project, we can compare the planned task & easy to identify the issues that may prevent the project from staying on schedule.

The above also provides for a sequential study of existing facilities and helps identify the Gaps at every stage.

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Existing Plant Documents (PFD, P&ID Etc.) Study

Prior to visiting site, its better to study the available documents:

- Existing Plant Layout (PFD, P&ID, GA Drawing, BEP)
- Plant Performance Log Sheets (Daily MIS, Breakdown List Etc.)
- Lab SOPs (With O&M Manual, Any PPT Etc.)

The study of above documents shall be to fix:

1. Tag No.
2. Material Of Construction (MOC)
3. Capacity
4. Design Inlet and Outlet Parameters
5. Actual performance based on daily report.

Before, further study summary of above shall be generated in form of:

A. Flow Sheet of Process
B. Liquid and Solid Balance with special focus on Sludges
C. Master Equipment list and Performance Benchmark for Each Unit Operation
D. Data Analysis to obtain Average, Maximum and Minimum for each Specific Data throughout Month, Year etc.
E. List a Missing Point (Process Objective, Risk, Failure, Wrong MOC or lack of instrument)

The E is the most important as each document study must generate a list of GAPs with Tag as (Nice to have or Must Have)

Reader's can ask for free the Formats in XLS.

Documents Validation:

Data validation procedure can be defined in few points:

Capacity Analysis:

It's the initial step, which identifies the difference between potential capacity and actual output currently achieved.

Make a separate report of your analysis with mentioning following points:

- Actual Capacity
- Performance status
- Actual Efficiency
- Breakdown/Standby Status

Study Performance Parameters:

While monitoring the parameters of any process through their provided data we need to make a separate sheet consisting of each & every equipment with their inlet or outlet parameters.

If any data is not accurate or missing in report during analysis, then parameter be highlighted.

Make a separate report of your evaluation on lab parameters also arrange the data based on your understanding with benchmark data.

Challenges in Data Validation:

Validating the data can be highly time-consuming task, especially when dealing with the large database of overall production.

Expected Outcome of Back Office Validation:

The Study and Validation provides a checklist to engineer that is their "Question Paper" and need to be answered during Physical Presence at Site.

Plant Engineers normally do not update their drawings and documents over the years for simple/critical changes they make in their plant. The preparedness before visiting site is to understand such changes and effect on overall operations.

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Site Visit: Technical Validation

For a basic understanding of industry from validation of documents (PFD, P&ID, GA Drawing), we need to go on the ground through site visit, so that we can offer better guidance, support, and supervision to them for achieving their production at satisfied level.

Some necessary points to visit a site plant systematically are:

1. For more technical and practical knowledge about the industry
2. Regular Quality Inspection of concern area
3. For clearing your Concern Points
4. To increasing Collaboration
5. To improving quality of product

Being on site, you should know that you have must be proper understanding of their existing equipment, process of each equipment and expected performance, and basic industrial knowledge.

A sample of existing equipment's Data Sheet Format mentioning following points:

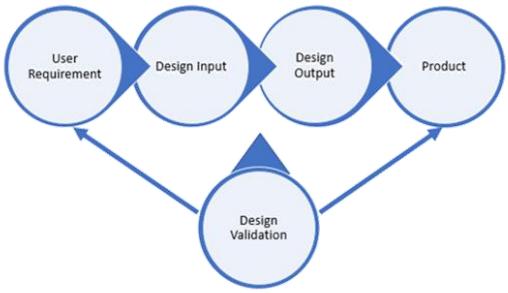
1. Equipment Name with Availability
2. Model/MOC
3. Any other equipment Requirement
4. Capacity/Head
5. Size/Other Detail
6. Quantity
7. Dimensions

Conventional ETP Equipment Data						
Sr. No.	Tag No.	Title	MOC	Dimensions	Capacity (KL)	Qty
1	H-Tank	Collection Tank	RCC	L=10.0, B=3.3, H=2.35	70	1
2	SRT	Static Reaction Tank	RCC With Acid Tiles	l=2.25, B=2.25, H=4	20	4
3	Primary CLF	Clarifier	RCC	D=7.00, H=2.20	85	1
4	B-Tank		RCC	L=5.5, B=5.75,H=3.1	100	1
5	BR-I	Bio Reactor-I	RCC	L=26, B=10.3, H=3.8	1000	1
6	BR-II	Bioreactor-II	RCC	L=7.2, B=5.7, H=2.8	100	1
7	CL-I	Clarifier	RCC	D=4.0, H=2.75	35	1
8	CL-II	Clarifier	RCC	D=4.0, H=2.75	35	1
9	Flash Mixture	_	RCC	D=3.5, H=2.85	27	1
10	CL-III	Clarifier	RCC	D=4.0, H=2.75	35	1
11	T-106	Tank	RCC	L=4.0, B=1.7, H=2.2	15	1
12	T-107	Tank	RCC	L=4.0, B=4.0, H=2.5	40	1
13	Pressure Sand Filter	Filter	MS	D=1.25, H=2.75	3.75	1
14	Pressure Carbon Filter	Filter	_	D=1.25, H=4.25	5	1
15	GP-II	Guard Pond	RCC	L=5.5, B=5.5, H=2.32	70	1
16	F/D sump	F/D sump	RCC	L=5.5, B=5.5, H=1.35	40	1
17	Filter press	_	_	NA	NA	1
18	E-Tank	High TDS Tank	RCC	10*6.3*2.35	150	1
Conventional ETP Equipment Data						

Equipment Design Capacity Validation

Equipment Design Capacity Validation is a step to ensure the equipment capability of achieving the intended results.

Scope of Equipment Capacity Validation



Design Capacity Validation of existing equipment consists of following key points needs to be in monitored:

- Category of equipment
- Description of Equipment Section
- Downtime/Stand by Status
- Reason
- Duration

Site review support us to evaluate the exact issue in process. When we review on site, we must have to follow some rules given below:

- You must have PPEs
- Proper Site Safety Training
- Known about Safety Programs and culture.

During Round or visit on site you must have an operational data of their process/production & points needs to be evaluate given below:

- Process Log Sheet
- Chemical Consumption Data
- Equipment P&I
- Digital Analyzer Record (If required)
- CIP/Backwash Data

Equipment Design Capacity Validation…. Cond.

Below is the format of Operational Data Sheet with editable equipment's details or their other specifications along with Lab Parameters:

HRSCC Performance		PH	Conductivity @ 25 °C	Turbidity	TDS	TSS	P^ Alkalinity as CaCO3	MO^ Alkalinity as CaCO3	Ca Hardness as $CaCO_3$	Mg Hardness as $CaCO_3$	Total Hardness as $CaCO_3$	Sulphates as SO_4	Phosphate	Iron as Fe	Reactive Silica as SiO_2	COD
		-	µ mho /cm	NTU	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg /l	mg/l	mg/l
Design In				10		30		100	260	160	410	300	10	1.5	65.0	60
In	Minimum	7.0	500.0	0.2	325.0	1.0	0.0	33.0	97.0	33.0	158.0	64.0	1.5	0.1	11.0	40.0
	Maximum	7.5	987.0	4.6	696.0	24.0	0.0	110.0	260.0	160.0	410.0	215.0	9.3	0.5	36.2	92.0
	Avearge	7.2	739.7	2.8	510.7	6.3	0.0	49.2	149.8	96.8	246.3	127.6	5.1	0.1	21.7	53.9
Design Out				NIL		NIL		22	110	5	116	300	-	1.5	10.0	20
Out	Minimum	10.3	776.0	0.6	504.0	1.0	61.0	100.0	207.0	30.0	259.0	105.0	1.1	0.0	7.8	40.0
	Maximum	10.7	922.0	2.7	599.0	4.0	77.0	108.0	236.0	87.0	302.0	184.0	1.5	0.1	15.1	40.0
	Avearge	10.5	844.6	1.4	548.9	2.5	67.3	104.9	225.1	57.6	282.7	140.3	1.3	0.1	11.0	40.0
Efficiency				47.8	-7.5	60.6			-50.3	40.5	-14.8	-9.9	74.9	57.9	49.1	25.7

Generally, every operational data consists of some important points. Study an industrial plant systematically can be divide into below steps:

Key Parameters of Process

Sludge/Waste Generated Data

Unit wise Flow/Volume

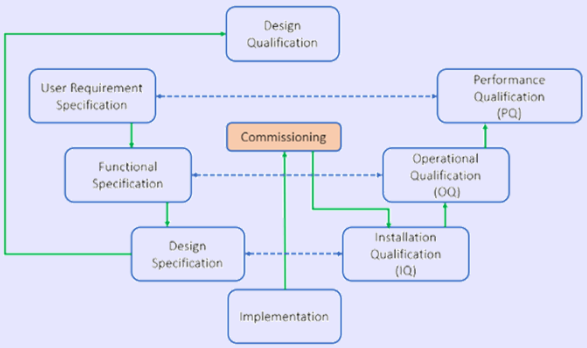
Design Qualification

The DQ Provides documented verification used to report or review of a plant design. It consists documented verification the design of equipment or plant will result in a system that suitable for the intended purpose.

Design Qualification step consist of:

- Equipment & User Requirement Specification
- Periodic Review of documents
- Critical Design Elements
- Point out the system risk assessments.

The detailed description chart of qualifications needs to be studied an industrial plant systematically is as:



Operational Qualification:

OQ Describes about all procedures for start-up, Operation, Maintenance, Safety, and cleaning/Disinfection are described. It is also called SOP's (Standard Operating Procedure). OQ report describes how the Equipment's or installation functions normally.

These often include OQ's Purpose is to determine with the following points:

- Temperature control and variations
- Protection systems
- Humidity-measuring and control Instruments
- Motors and Air Flaps Details
- Controllers Details

Performance Qualification

The Final step of qualifying equipment is Performance Qualification. It verifies and documents that the user requirements.

It includes normal operating range required (as defined and signed off on by QA and verified in the DQ.) Once you qualified the equipment, you can develop each process required for each product.

This step consists of two main steps:

- Design of the facility and qualification of the equipment and utilities.
- Process Performance Qualifications (PPQ)

Installation Qualification:

The IQ Protocol consists of that peripheral Equipment's/Units are installed in accordance with installation plans or specifications.

Furthermore, it includes a detailed list of cGMP requirement applicable to this installation.

These requirements must be met before the IQ can be completed and one can proceed with the operational qualification.
It consists following points to proceed:

The challenges to achieving IQ, OQ, PQ Success:

While the basics of IQ, OQ, PQ are critically important to understand and implement, It's also critical to acknowledge the challenges teams encounter when doing this work in the field. Here are the key points of the success of every Industrial Project

A. We must predict the exact equipment performance through our Site Visit, Interaction with their team people and with the help of data we got or based on our analysis. Operational Data I Lab Parameters Performance | PFDs | Images | Site Round Review Report

B. All images should be parked in a separate folder or arrange in any presentation for further use.

Images taken during our site visit have a huge role in our analysis. Here are some advantages of taking pictures during site visit into our performance analysis:

- Easily helpful to visualize the equipment design/work.
- Go through with all operational data you got from client or based on your analysis at site visit. Review them and try to find out the root cause of their concern area with coordinate their team also.

Then finally we can prepare a scope of improvement and modification of the concern area with Must have & Nice to have analysis & Budgets.

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March 22, 2023

Is the world water day !!

Join us for celebration of the same in form of a training program and a quiz on water.

Venue

Ahmedabad Management Association

ATIRA Campus, AMA Complex,
Dr. V S Marg, Vastrapur,
Ahmedabad 380 015

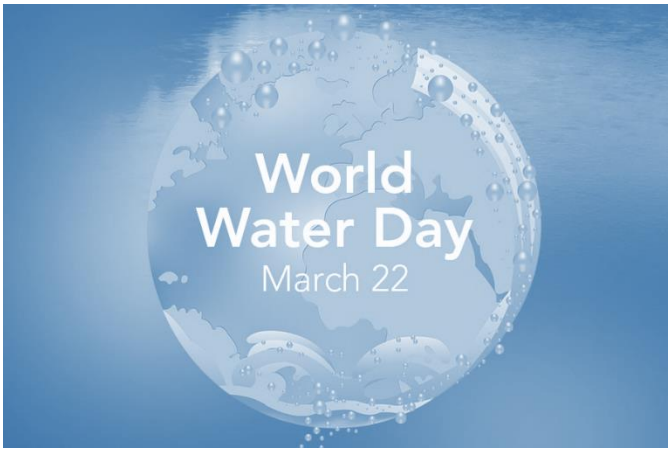
Time : 10 AM to 3.30 PM

This program is free and open to all water and waste water management professionals. The program shall also be integrated with live "Team link" so that you can join us "Online" if you can not travel to Ahmedabad.

The Program is designed by "Sanjeev Srivastava" and shall cover:

A. Innovation Possibilities in Water & Waste Water Management : Future Business.

B. Online Quiz with Award.



Complimentary Lunch & Tea
Register with Ms Nidhi Jain
95129 55227 info@aktionconsultancy.com

जल जीवन जननी !!

Our world is Waughter

The technical knowledge share attempt of Aktion Consultancy and the contents in the magazine shall be qualified by Sanjeev Srivastava our Technology Lead.

Our next edition focuses on: "Role of Civil Engineering in Water & Waste Water Management"

Please feel free to contact Ms Nidhi Jain 95128 55227

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