

COMMISSIONING AND HANDOVER OF A GREENFIELD MEMBRANE WATER TREATMENT PLANT



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*5th Annual WIOA NSW Water Industry Engineers & Operators
Conference
Exhilarating Events Centre, Newcastle
29 to 31 March, 2011*

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ABSTRACT

The Strategic Drinking Water Management Plan adopted by MidCoast Water identified the need to introduce infrastructure which would provide world class quality drinking water utilizing the best available and suitable technology, compatible with the existing water supply, with sufficient capacity to cater for the forecast growth and consumption of the customer base.

In March 2007 MidCoast Water, the Principle, had awarded all contracts and subsequently commenced construction of a new Membrane filtration plant adjacent to the existing treatment and pump station. The objective was to integrate the three prime contracts seamlessly and ensure a smooth transition of handover for the Operations function of MidCoast Water.

1.0 INTRODUCTION

The Manning River has been the primary water source for the reticulation supply of the MidCoast Water area encompassing Crowdy Head in the North, Tarbuck Bay in the South and west to Wingham and Krumbach. The Manning District Water Scheme currently serves a population of approximately 67,000 which increases to an estimated 80,000 during the holiday seasons.

The existing system for the supply of drinking water comprised of a Pumping station (1A) on the Manning River feeding water directly to Bootawa Dam. The raw water was gravity fed into the Bootawa pumping station (2A) dosing was chlorination and fluoridation prior to distribution to the 3 main network tributaries of Koorainghat, Lantana and Wingham.

The network system comprises of 28 reservoirs, 10 pumping substations, 420 kilometers of main pipeline and 280 kilometers of smaller arterial pipeline.

The process elements and associated infrastructure of the new plant comprised of:

- Raw water feed options either via the existing dam or direct from the river feed via a balance reservoir (2.5 ML)
- Pre Dosing consisting of Lime and Carbon Dioxide
- Raw water inlet screening
- Raw water inlet and coagulant dosing
- Membrane filtration
- Ozone disinfection
- Bacterially activated carbon filtration
- Chlorine dosing
- Fluoride dosing
- Post process PH balance via soda ash dosing
- Storage in a treated water reservoir (9 ML)
- Waste water recirculation system
- New pump station comprising 7 pumps to 3 distribution networks
- Buildings and associated systems
- Security, comms and AV systems
- SCADA management systems

- All tanks and reservoirs
- A new Laboratory and relocation of the existing staff & equipment
- Landscaping and gardens
- Roads and infrastructure.

The 3 prime contracts were allotted the following scopes:

- Contract 1: Design, supply install & commission all process equipment
- Contract 2: Design all civil works including raw water feed, buildings, roads and associated infrastructure.
- Contract 3. Supply, construct, install, test and commission all civil works covered under contract 2.

The timeline in order of contract was:

- Contract 2
- Contract 3
- Contract 1 (this contract was let 1st to permit process design).

There was overlap with contracts 2 and 3, and 1 and 3 throughout the project phase. The limits of contract were clearly defined, however there was an ongoing need for liaison and interface to ensure that the physical limits of the contracts were measured and monitored continuously to avoid error, disruption, delay and mitigate the risks to all stakeholders.

2.0 DISCUSSION

2.1 The Challenges

The challenges were diversified and numerous and consisted of:

- Identifying the risks
- Identifying the stakeholders
- Implementing sound Project Management principles to ensure scope management, quality management, safety and environmental management.
- Identifying measuring and monitoring critical areas for inspection
- Adequate resourcing by the Principal to ensure audit, witness and hold points were scrutinized and suitably weighted to the degree of process importance and risk
- Reinforcing the emphasis on the Commissioning and test process and incorporating all the elements that verify commissioning is complete and the asset is specification compliant, fit for purpose and operable.
- Early induction of the key stakeholders to enable input, operator compatibility and enable a smoother transition for handover.
- Providing forums for communication between stakeholders, suppliers and contractor representatives to ensure that transparency and message relay was consistent and stable.
- Ensuring the elements for handover were planned and implemented at appropriate times commensurate to key and critical components of the commissioning and testing process eg; training, regulatory certification, approvals and test regimes.
- Recording and detailing the new assets ensuring that all necessary links and attributes fit within the organisational procedures base. Including integrating the new facility with existing business systems AIS, GIS, Insurances & Finance.
- Developing a project close out plan which ensured that all deliverables were identified and transmitted, that all records were appropriately managed and retrievable and that there was a mechanism for Post Implementation Review.

In addition, the lessons learnt from this project are transferred and adopted as part of continuous improvement and that there are mechanisms in place to deal with decommissioning of redundant plant.

2.2 The Risks

Risk management was basically a three step process:

- Identifying the risk
- Categorising the risk
- Risk mitigation.

Although the principles remained the same the process was ongoing. Risk identification became a day to day activity commensurate with the tasks and processes occurring throughout. There were several programmed tasks identified within the project scope which were directly linked as a predecessor to major activities within the commissioning program. These included milestone events within the test program such as testing major equipment or systems, introducing water to the system, introducing chemicals, changes in phases of the commissioning plan and introducing vendors of major equipment supply.

2.3 Stakeholders

Identification and management of stakeholders is vital to the outcomes and success of the commissioning and handover process. Early introduction, clear and open communication channels, invitation to review and participate in relative process elements and concise, timely and effective training are all factors necessary to ensure that ownership is transferrable and any gaps in the transfer process are minute and manageable.

2.4 Managing the Process

The common trait with the process of commissioning is that predominately it is always the last task or series of tasks within a project. Project resources are generally in decline, motivation of staff is ebbing and project specifications are more often than not, somewhat vague, ambiguous and inconclusive in the content detail. The perceptions of contractors, their understanding of the process and the associated commitment of resources to accommodate the task are often underestimated, notwithstanding this it is the project process that ensures the systematic integration, operability, repeatability and often the ongoing reliability of plant and equipment.

To ensure a successful outcome for this process, the tasks and eventual outcomes must be clearly specified, understood and measurable. Subject to the size and complexity of the plant and equipment being commissioned this becomes a sizeable project in itself. To manage this as such, recognised and proven Project Management tools must be adopted.

The primary components include but are not always limited to:

- Scope of works
- Task identification
- Resource – Material, skills (personnel), time
- Program
- Quality Management
- Planning
- Risk Management
- Measurement & review.

Once the scope has been established and agreed via release of commissioning plan/s the tasks can be identified, time lined, resourced and the outcomes can be measured and documented to ensure the respective element of the handover process is achieved.

Resourcing the process is commensurate with risk, budget and the degree of difficulty associated with each element or sub element of that equipment or system being tested, this is all proportional to time and the ability via a program to measure and forecast.

Measuring the results once the planning and Quality Management tools have been established is a subject to the detail contained within the quality documentation (ITP's) verifying the results of the witness and hold points is relative to the quantity of first time results achieved and the risk factors applied to the system or piece of equipment during the planning process.

The other measurement and review mechanisms used more for outcome and items parallel to the tasks but not always listed are:

- Meetings – The establishment of regular commissioning meetings is necessary to measure progress at regular intervals, establish results and changes as they become apparent and the process evolves and to clearly define responsibility for actions arising from meetings and timeline these commensurate to the degree of difficulty associated.
- Establish milestones within the project program, use these as datum's to review progress.

2.5 Asset Management

All Greenfield sites contain assets. The asset management plans established are critical to the ongoing effectivity and reliability of the plant. Managing the assets effectively requires at least the following considerations:

- Asset registration – minimum requirements eg, parenting links and dependency, traceability, identification
- Asset value
- Functionality
- Maintenance data – link to O&M's if applicable
- Compliance to standards if applicable
- Organisations financial requirements.

Every organisation is different, the common factor is that no asset is infinite, therefore within the planning and registration there must be criteria for ensuring that there are allowances for maintenance and replacement of all assts over time to ensure plant functionality and reliability.

2.6 Training

This is one of the most critical elements and predecessors to ensuring that the transition and ultimate handover to the end users of the plant is seamless and effective.

The training like the commissioning is a process and requires detailed planning, specification, outcomes and inbuilt measurement mechanisms which ensure that the delivery and receipt of the training modules are delivered and understood.

There are several components or elements that are critical to the outcome and must be incorporated into the planning, these include but are by no means limited to:

- Define the outcomes and expectations of the training with stakeholder consultation
- Ensure the modules are topical, relevant and deliverable
- Ensure there is a suitable environment to deliver the training
- Ensure the communication barriers do not evolve – delivery of modules is critical
- Traceability – ensure that records of all training are maintained, that attendees register and that there is competency evaluation and opportunity for candidates to demonstrate the skills attained
- Ensure that there is opportunity for feedback and open discussion, every person attending training needs to be given equal opportunity to learn, observe and critique the content
- Promote discussion often the quieter candidates will offer more in an environment where the emphasis on delivery is altered and discussion is the theme.
- The target audience, often personnel attend training or are nominated to training when they are not relative to or required to in the long term benefit from the delivery.
- Get feedback from the candidates and reinforce the training.

3.0 CONCLUSION

The process of commissioning and handover is no different in management than any other major project task. It is reliant on several factors that have been summarized within the content herein. Providing there is adequate planning, adequate specification, sufficient resource, commitment and consultation the process will be successful.