



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **NWP409A Investigate and plan to optimise the operation of chemical addition processes**

**Release: 2**

## **NWP409A Investigate and plan to optimise the operation of chemical addition processes**

### **Modification History**

NWP409A Release 2: Layout adjusted. No changes to content.  
NWP409A Release 1: Primary release.

### **Unit Descriptor**

This unit of competency describes the outcomes required to review, coordinate and optimise chemical addition processes and to evaluate and report on system performance and process quality control.

### **Application of the Unit**

This unit is required by technical staff with a responsibility for optimising chemical addition processes in water, wastewater and stormwater treatment plants and processes. This role may be a single operator or may be performed as part of a team with some responsibility for team coordination and supervision depending on the size of the treatment plant.

### **Licensing/Regulatory Information**

Not applicable.

### **Pre-Requisites**

Not applicable.

### **Employability Skills Information**

This unit contains employability skills.

### **Elements and Performance Criteria Pre-Content**

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where <b><i>bold italicised</i></b> text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide.
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## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
<b>1 Evaluate coagulation and flocculation process performance.</b>	<p>1.1 Review existing process performance data against relevant <i>organisational and legislative requirements</i>.</p> <p>1.2 Identify the impact of <i>changing raw water quality</i> on chemical addition processes as required.</p> <p>1.3 Identify and coordinate any additional sampling and <i>testing</i> required for valid evaluation of current process performance.</p>
<b>2 Investigate chemical addition plant configuration.</b>	<p>2.1 Review existing fault reports and other relevant plant asset information.</p> <p>2.2 Investigate the operational status of <i>plant components</i> with reference to <i>manufacturers' and plant designers' specifications</i>.</p> <p>2.3 Carry out <i>plant configuration</i> investigations to identify potential deficiencies.</p>
<b>3 Investigate chemical options for process optimisation.</b>	<p>3.1 Review current chemical addition practices with reference to organisational procedures to identify potential deficiencies.</p> <p>3.2 Investigate dosing options for current <i>chemicals</i>.</p> <p>3.3 Identify and investigate new or additional chemicals and related dosing options.</p>
<b>4 Develop and record a plan for process optimisation.</b>	<p>4.1 Determine plant configuration or chemical options for process optimisation.</p> <p>4.2 Plan a trial to test the performance of the determined optimisation options.</p> <p>4.3 Compile report with recommendations on optimisation options.</p>

## Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

### Required skills:

- investigate and report on operational and control system problems
- coordinate sampling and testing
- conduct a full range of jar tests covering various water quality scenarios
- perform mathematical calculations to provide data for the analysis and development of options and solutions
- investigate chemical dosing
- interpret plans, charts and instructions
- operate control and communication systems
- use safety and personal protective equipment
- communicate with colleagues, consultants and suppliers
- produce optimisation reports
- interpret a range of complex and technical documents, including relevant:
  - regulatory, legislative, licensing and organisational requirements
  - codes and standards
  - specifications
  - organisational policies
- articulate complex ideas clearly
- analyse and evaluate reports and reference materials
- work collaboratively with relevant stakeholders and team members
- analyse problems and recommend appropriate remedial solutions
- identify and respond to risks and hazards
- identify opportunities for improved water management
- participate in the provision of appropriate information to inform workplace processes
- manage work priorities
- use information effectively to improve work performance

### Required knowledge:

- the role of chemical addition in water treatment
- the principles of chemical addition, including enhanced coagulation
- chemical addition plant and equipment and system layout
- chemical concepts and reactions relevant to chemical addition processes, including pH and alkalinity
- the range and characteristics of chemicals used in chemical addition processes
- the functions of various chemicals in chemical addition processes
- factors influencing the effectiveness of chemicals in chemical addition processes
- the factors affecting the selection of chemicals in chemical addition processes
- relevant historical records
- relevant legislation

- relevant enterprise policies
- range of appropriate measuring and testing procedures
- investigation procedures
- risk management principle
- customer expectations and requirements
- occupational health and safety and environmental legislation
- relevant legislation, standards and workplace policies and procedures

## Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

### **Critical aspects for assessment and evidence required to demonstrate competency in this unit**

The candidate should demonstrate the ability to review, coordinate and optimise chemical addition processes including:

- reviewing existing process performance with reference to historical data, differences in raw water quality and plant configuration
- identifying data deficiencies and organising additional data collection through appropriate sampling and testing
- assessing fault reports and investigating the current operational status of plant components
- investigating current and potential chemical addition practices
- planning trials to test the performance of the determined optimisation options and compiling reports making recommendations

### **Context of and specific resources for assessment**

Access to the workplace and resources, including:

- documentation that should normally be available in a water industry organisation
- relevant codes, standards and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence only taken at the point when the assessor has complete confidence in the person's competence over time and in various contexts
- all assessment that is part of a structured learning experience must include a combination of direct, indirect

and supplementary evidence

- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

Questioning will be appropriate to the skill levels of the operator and cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

## Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

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|---|---|
| <b><i>Organisational or legislative requirements</i></b> may include:         | <ul style="list-style-type: none"><li>• organisational performance quality standards</li><li>• standard operating procedures</li><li>• quality assurance guidelines</li><li>• federal, state and local environmental and water quality legislation</li><li>• occupational health and safety requirements</li><li>• water quality standards and guidelines</li></ul> |
| <b><i>Changing raw water quality</i></b> may include:                         | <ul style="list-style-type: none"><li>• pH</li><li>• turbidity</li><li>• colour</li><li>• presence of algae</li><li>• temperature</li></ul>   |
| <b><i>Testing</i></b> may include:  | <ul style="list-style-type: none"><li>• jar testing</li><li>• flocculation growth</li><li>• mixing energy</li><li>• UV absorbance</li><li>• pH</li><li>• colour</li><li>• turbidity</li><li>• residual aluminium or iron</li><li>• quality of treatment chemicals</li></ul>   |
| <b><i>Plant components</i></b> may include:                                   | <ul style="list-style-type: none"><li>• mixing equipment</li><li>• streaming current detector</li><li>• dosing pumps</li><li>• chemical injection equipment</li><li>• turbidity meter</li><li>• particle counter</li></ul>  |
| <b><i>Manufacturers' and plant designers' specifications</i></b> may include: | <ul style="list-style-type: none"><li>• dosing pump capacity and calibration charts</li><li>• detention times</li><li>• mixing intensity for flash or rapid mixing and flocculation</li></ul>   |
| <b><i>Plant configuration</i></b> may include:                                | <ul style="list-style-type: none"><li>• location of chemical dosing points</li><li>• mixing or reaction detention times</li><li>• type of mixer or impeller</li></ul>   |



**Chemicals** may include:

- Polyaluminium chloride (PACL)
- aluminium sulphate
- aluminium chlorohydrate (ACH)
- ferric chloride
- ferric sulphate
- polyDADMAC
- polyacrylamide
- sulphuric acid
- hydrated lime
- caustic soda

## **Unit Sector(s)**

Not applicable.

## **Competency field**

Treatment.