Australian Government

Department of Education, Employment and Workplace Relations

SFIAQUA410B Implement a program to operate, maintain or upgrade a system comprising high technology water treatment components

Release: 1

SFIAQUA410B Implement a program to operate, maintain or upgrade a system comprising high technology water treatment components

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit of competency involves implementing a program for the operation, maintenance or upgrade of a system or facility using high technology water treatment components. Maintenance may be scheduled or emergency action, and upgrade may include expansions and retrofits. The unit covers the review of records and the trial of new processes to improve performance. It also covers supervising staff, system or facility operations, conveying information, maintaining or upgrading high technology equipment and associated infrastructure, and overseeing the use of construction materials and tools. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.

Application of the Unit

Application of the unit	The unit applies to an aquaculture or holding facility in the seafood industry, or to an aquascape or holding tank in the ornamental or pet sector that uses a recirculating aquaculture system (RAS) with high technology water treatment components. The unit applies to personnel who have technical skills and supervise staff. Construction or installation of systems or facility, cultured or held stock husbandry, harvesting and post-harvest activities are covered by other seafood processing, seafood sales and distribution, or rural production units of competency. Supervisory skills are covered by AHCWRK403A 4908A Supervise work routines and staff performance. All enterprise or workplace procedures and activities are carried out according to ***relevant government regulations***, ***licensing and other compliance requirements***, including ***occupational health and safety*** (***OHS***) ***guidelines***, ***food safety and hygiene regulations and procedures***, and ***ecologically sustainable development*** (***ESD***) ***principles***. Equipment operation, maintenance, repairs and calibrations are undertaken in a safe manner that conforms to manufacturer instructions. Appropriate ***personal protective equipment*** (***PPE***) is selected, checked, used and maintained.

Licensing/Regulatory Information

Refer to Unit Descriptor

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	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 bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Plan for the operation and maintenance of ***high technology water treatment components*** of a ***RAS***	1.1. Operations, ***maintenance*** or ***design or upgrade specifications*** for high technology water treatment components in the ***culture or holding system or facility*** are confirmed with senior personnel. 1.2. ***Work plans or schedules*** are drawn up, materials ordered, labour arranged, and contractors or tradespeople and appropriate equipment booked according to specifications and in consultation with senior personnel. 1.3. Raw and prefabricated materials are checked against delivery manifest or specifications. 1.4. ***Worksite*** is prepared according to specifications and secured, if necessary, for safety or loss prevention. 1.5. Potential ***risks*** are assessed, including ***environmental parameters*** and ***water quality parameters*** for the cultured or held stock, and ***contingency plans*** prepared accordingly. 1.6. Options for mechanisation or automation of process or activity are assessed, including the use of specialised contract services. 1.7. Staff members are briefed on work objectives relevant to the site, equipment being used and type of maintenance or upgrade activities. 1.8. Costs are identified, quantified and confirmed with senior personnel as within budget.
2. Implement operations, maintenance or upgrade program	2.1. Work plan is implemented and scheduled to minimise disruption to enterprise operations and stress to cultured or held stock. 2.2. Progress of maintenance or upgrade program is monitored against the work plan, and adjustments are made for delays and unforeseen circumstances. 2.3. Required materials, ***resource and supply provisions*** and labour, including contractors or tradespeople, are confirmed as available, and contingency plans implemented, where appropriate. 2.4. Workplace OHS hazards, environmental implications and other potential problems are anticipated and avoided or minimised through forward planning and contingency planning.
3. Monitor operations, maintenance or upgrade activities	3.1. Operations, maintenance or upgrade activities and component or system performances are monitored against maintenance or upgrade plan for efficiency and effectiveness.

ELEMENT	PERFORMANCE CRITERIA
	3.2. Risk management strategies or treatments are applied and updated as required. 3.3. Costs and key performance indicators (KPIs) are monitored and controlled within enterprise budget requirements. 3.4. Staff members are given feedback on work progress and performance on a regular basis. 3.5. Regular ***records or reports*** are given to management on project progress. 3.6. Checking and commissioning are undertaken to ensure that the maintained or upgraded system or facility fits maintenance or design specifications and is effective and operable. 3.7. Budget for operations, maintenance or upgrade is checked and major discrepancies are reported to senior personnel.

ELEMENT	PERFORMANCE CRITERIA
4. Finalise and review operations, maintenance and upgrade activities	4.1. Clean up of work area, including repairs and storage of equipment, is supervised and condition report prepared. 4.2. Relevant operations, maintenance and upgrade data, observations or information are recorded legibly and accurately, and any out of range or unusual records checked. 4.3. Compliance and other required reports are prepared and conveyed to senior personnel advising of the effectiveness of operations, maintenance and upgrade, and recommendations made for improvements. 4.4. Staff are given feedback on their work performance. 4.5. New processes to improve performance are developed, as required, and trialled.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analysing problems, devising solutions and reflecting on approaches taken • communicating and liaising with managers and external tradespeople and designers • communicating information about operations, maintenance and upgrades to the work team, including establishing and documenting protocols and procedures • assessing options for mechanisation or automation of process or activity, including the use of specialised contract services • documenting plans, maintaining accurate records and writing reports • establishing and monitoring performance targets for operations, maintenance or upgrade work team • estimating and calculating resource requirements, machinery and servicing costs • implementing management policies and procedures relating to retrofitting, upgrading or replacing components in work area • providing feedback to team leaders and staff in the operation, maintenance or upgrade program, including the implementation and improvement of component efficiency • planning, costing and scheduling operations, maintenance or upgrade requirements • selecting and maintaining stocks of spare parts and backup components, including construction materials and tools.

REQUIRED SKILLS AND KNOWLEDGE

Literacy skills used for:

- documenting schedules, protocols and work procedures
- interpreting operating manuals and manufacturer instructions
- reading and analysing plans
- reading and writing reports.

Numeracy skills used for:

- calculating and analysing KPIs
- estimating, measuring and undertaking calculations, such as measurements of length, time, area, volume, mass balance equations, and volumes and quantities of inputs and outputs of liquids, gases and solids
- monitoring project costs
- monitoring quantities of material or supplies against specified requirements and on-site usage patterns.

Required knowledge

- federal, state, territory and local government laws and regulations relating to:
  - environmental sustainability, particularly strategies and regulations/license conditions for waste and effluent minimisation and methods of disposal
  - OHS for staff, management, contractors and visitors
  - translocation of exotic or introduced species and biosecurity issues
  - withholding periods when using chemicals or medications
- financial and administrative procedures such as cost control, budgeting, ordering and receiving of materials and services
- identification and adoption of best practice management
- impacts of inputs on systems and component operation and on maximum operation loads
- plan reading or interpretation
- project scheduling and management
- requirements for record keeping, data collection and analysis
- risk identification, assessment and mitigation or management, which may include emergency procedures and crisis/disaster management
- standards, manufacturer guidelines and approaches to the implementation of operations, maintenance or upgrade of systems and facilities containing high technology water treatment components, such as:
  - association between water hydraulics, water chemistry and oxygenation, supersaturation and gas exchange
  - biology of stock and environmental and husbandry requirements within RAS to achieve growth targets

REQUIRED SKILLS AND KNOWLEDGE

- commissioning or start-up of new or upgraded systems or facilities
- customisation and retrofitting of components
- fish biology, physiology, breeding and life cycles in recirculation systems, including the impact and management of stress on culture or holding stock
- forward planning and risk management for events, such as blackouts, brownouts and equipment breakdowns
- importance of optimised production to achieve sound economic outcomes
- mechanical and technical aspects of recirculation systems, including energy use, mass balance, water hydraulics and flow, and pumps and pipe work
- monitoring basic and advanced environmental and water quality parameters
- nitrification and other bacterial process and requirements, including biofilter start-up, shock-loading and maintenance
- operations and maintenance of water treatment components, including back-flushing filters, cleaning (pigging) of water supply and disposal lines, and routine dry-outs
- optimal and critical levels for water quality parameters, such as temperature, pH (alkalinity/acid balance), dissolved oxygen, nitrogenous wastes and carbon dioxide
- training and instruction techniques for directing the learning of staff
- types of operations, maintenance requirements and servicing cycles for property, machinery and equipment
- use of KPIs for benchmarking within the system and against other systems or facilities.

Evidence Guide

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.	
Overview of assessment	
Critical aspects for assessment evidence required to demonstrate competence in this unit	Assessment must confirm ability to • plan and implement an operations, maintenance or upgrade program for a system or facility using high technology water treatment components. Assessment must confirm knowledge of: • approaches to coordinating operations, maintenance or upgrade of a system or facility • approaches to interpretation of design plans and specifications • approaches to establishing protocols and procedures for carrying out maintenance and upgrade tasks.
Context of and specific resources for assessment	Assessment is to be conducted at the workplace or in a simulated work environment. It should use of a RAS typically used in aquaculture, holding or ornamental facilities in the region. Resources may include: • documentation relevant to the operations, maintenance or upgrade program, including design specifications for the components, system or facility to be maintained or upgraded • staff that can be supervised in the operations, maintenance or upgrade of a system or facility • personnel who have a role and responsibility in implementing and/or monitoring the effectiveness of the operations, maintenance or upgrade program.
Method of assessment	The following assessment methods are suggested: • project (work or scenario based) • portfolio of supporting documentation that demonstrates, for example: • the efficient operation of a system or facility using high technology water treatment components

EVIDENCE GUIDE	
	• an improvement or implementation of an operations, upgrade or maintenance program • an improvement or implementation of work procedure • work diary, photographs or videos • demonstration of required skill.

EVIDENCE GUIDE	
Guidance information for assessment	This unit may be assessed holistically with other units within a qualification.

Range Statement

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.	

Relevant government regulations, ***licensing and other compliance requirements*** may include:	• business or workplace operations, policies and practices:
	  • commercial law, including fair trading and trade practices
	  • consumer law
	  • corporate law, including registration, licensing and financial reporting
	  • disability policies and practices
	  • equal opportunity, anti-discrimination and sexual harassment
	  • industrial relations and awards, individual employment contracts and, share of catch agreements
	  • jurisdictional variations
	  • superannuation
	  • taxation
	  • trade practices
	  • warnings and dismissals
	  • worker's compensation
	• ESD principles, environmental hazard identification, risk assessment and control
	• fisheries or aquaculture regulations, permits, licences, quotas, catch restrictions and other compliance requirements, including:
	  • Australian Exclusive Economic Zone
	  • international treaties and agreements

RANGE STATEMENT	

	• food safety, Hazard Analysis Critical Control Point (HACCP), hygiene and temperature control along chain of custody
	• imports quarantine and inspection, and importing approved arrangements for Australian Quarantine Inspection Service (AQIS), Australian Customs Service (ACS) and Biosecurity Australia (BA)
	• Indigenous native title, land claims and cultural activities, including fishing by traditional methods
	• maritime and occupational diving operations:
	  • foreign and Australian legislation applying to quarantine and customs
	  • International Convention for the Safety of Life at Sea (SOLAS)
	  • International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW 1978)
	  • Marine Emergency Response Search and Rescue (MERSAR)
	  • National Standards for Commercial Vessels
	  • pollution prevention - International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)
	  • Uniform Shipping Laws (USL) Code
	  • use of vessels, right of way and other marine orders, bunkering and refuelling
	• land, buildings and vehicles:
	  • buildings and structures design and appearance, constructions and additions
	  • poaching, trespass and theft
	  • road laws for use of motor vehicles, bikes, trucks and other transport equipment
	  • soil and water management
	  • use of chemicals and biological agents
	  • use of firearms and powerheads
	  • use of utilities, including water, natural gas, electricity and sewage
	  • water or land lease, tenure or ownership and use
	• OHS hazard identification, risk assessment and

RANGE STATEMENT	

	control
	• product quality assurance:
	  • correct naming and labelling (e.g. country of origin, Australian Fish Names Standard and eco-labelling)
	  • correct quantities, sizes and other customer requirements
	  • third-party certification (e.g. Australian Grown and ISO 14001:2004 Environmental management systems).

RANGE STATEMENT	
OHS guidelines may include:	• appropriate workplace provision of first aid kits and fire extinguishers • clean, uncluttered, hygienic workplace • codes of practice, regulations and/or guidance notes which may apply in a jurisdiction or industry sector • enterprise-specific OHS procedures, policies or standards • hazard and risk assessment of workplace, maintenance activities and control measures • induction or training of staff, contractors and visitors in relevant OHS procedures and/or requirements to allow them to carry out their duties in a safe manner • OHS training register • safe lifting, carrying and handling techniques, including manual handling, and the handling and storage of hazardous substances • safe systems and procedures for outdoor work, including protection from solar radiation, fall protection, confined space entry and the protection of people in the workplace • systems and procedures for the safe maintenance of property, machinery and equipment, including hydraulics and exposed moving parts • the appropriate use, maintenance and storage of PPE.
Food safety and hygiene regulations and procedures may include:	• Australian Shellfish Sanitation program • display, packaging and sale of food, including seafood and aquatic products • equipment design, use, cleaning and maintenance • exporting requirements, including AQIS Export Control (Fish) orders • handling and disposal of condemned or recalled seafood products • HACCP, food safety program, and other risk minimisation and quality assurance systems • location, construction and servicing of seafood premises • people, product and place hygiene and sanitation requirements

RANGE STATEMENT	
	• Primary Products Standard and the Australian Seafood Standard (voluntary) • processing, further processing and preparation of food, including seafood and aquatic products • product labelling, tracing and recall • receipt, storage and transportation of food, including seafood and aquatic products • requirements set out in Australian and New Zealand Food Authority (ANZFA) Food Standards Code and state and territory' food regulations • temperature and contamination control along chain of custody.

RANGE STATEMENT	
ESD principles may include:	• controlling use and recycling of water, and managing water quality and quantity • increasing use of renewable, recyclable and recoverable resources • managing environmental hazard identification, risk assessment and control • managing imported products quarantine and inspection, facility biosecurity, translocation of livestock and genetic material, health certification • managing stock health and welfare, especially for handling, holding, transport and slaughter • managing sustainable fisheries or broodstock/seedstock collection requirements, such as size limits, quotas, season restrictions, population dynamics, fishing impacts, reducing by-catch, fisheries management strategies and maintaining biodiversity • managing, controlling and treating effluents, chemical residues, contaminants, wastes and pollution • minimising noise, dust, light or odour emissions • planning environmental and resource efficiency improvements • preventing genetically modified and live cultured or held organisms from escaping into environment • protecting native and protected flora and fauna, marine or land parks or areas, adhering to the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Ramsar Convention, World Heritage and other international treaties for which Australia is a signatory • reducing emissions of greenhouse gases • reducing use of non-renewable resources • reducing disturbances to soils, erosion and surface water flows from machinery use and other activities • reducing energy use and introducing alternative energy sources.
PPE may include:	• buoyancy vest or personal floatation device (PFD)

RANGE STATEMENT	
	• gloves, mitts or gauntlets, and protective hand and arm covering • hard hat or protective head covering • hearing protection (e.g. ear plugs and ear muffs) • insulated protective clothing for freezers or chillers and refrigeration units • non-slip and waterproof boots (gumboots) or other safety footwear • personal locator beacon or Emergency Position Indicating Radio Beacon (EPIRB) • protective eyewear, glasses and face mask • protective hair, beard and boot covers • protective outdoor clothing for tropical conditions • respirator or face mask • safety harness • sun protection (e.g. sun hat, sunscreen and sunglasses) • uniforms, overalls or protective clothing (e.g. mesh and waterproof aprons) • waterproof clothing (e.g. wet weather gear and waders).

RANGE STATEMENT	

High technology water treatment components may include:	• aeration or oxygenation equipment, such as aerators, aspirators, airlifts and fans
	• components that regulate environmental and climate control factors, such as temperature, photoperiod and light intensity
	• degassing systems for removing carbon dioxide and ozone, including the use of specialised air filters
	• facilities and processes designed for health management, such as quarantine area, sterilising using ultraviolet (UV) light and ozone, and pasteurising using heat or steam
	• mechanical/physical/solid, chemical and biological filtration devices (or a combination of two or more different types):
	  • biological filter:
	  • is part of an RAS where dissolved metabolic by-products are converted to less toxic forms by microbial action from a range of different bacteria, fungi and other microorganisms
	  • the most important function is the oxidation of ammonia to nitrite, and nitrite to nitrate (often called nitrification)
	  • chemical filter:
	  • examples include activated carbon, zeolites and other ion-exchange mediums
	  • is where a variety of chemical substances are used to treat water passing through them
	  • ozone and chemical, such as pH and alkalinity, adjustments are also made, sometimes in a separate area to the chemical filter
	  • mechanical/physical/solid filter:
	  • includes swirl separators, hydrocones, protein skimmers or foam fractionators, drum filters, belt filters, bead and other suspended media filters and screen filters
	  • is important to ensure organic loads going into biofilters are as low as possible to prevent the more competitive

RANGE STATEMENT	
	heterotrophic bacteria from taking over and reducing nitrification capacity • is part of an RAS that removes solid organic matter and other wastes • reduces the biological oxygen demand (BOD) for the system • some degassing or carbon dioxide stripping can also take place • ventilation systems, fans, blowers and humidifiers/ dehumidifiers • water treatment devices, such as those that maintain pH (acid/alkaline) balance.

RANGE STATEMENT	
A recirculating aquaculture system (***RAS***) is:	• a system in which at least some of the water is recycled one or more times back into the system after some form of treatment • also called a closed system (which is the opposite to a flow-through or open system where there is little residence time for the culture water) • where generally some form of water treatment with equipment or structures, particularly aeration or oxygenation and processing of nitrogenous wastes, is undertaken • where a water exchange (replacement) rate of 5-10% per day is used to assist in maintaining water quality (particularly nitrate control).
Maintenance may be required due to:	• acts of nature • corrosion • design problems • equipment modifications • incorrect use and accidents • wear.
Design or upgrade specifications may include:	• budget • compliance with the standard specification and legislation and regulations of the relevant state or territory construction and power authorities • construction materials • construction method • designated component or system • environmental constraints • equipment and resources • location • number • owner preferences • permits and licences • product availability • production requirement, including number, tonnage, timing and production characteristics • quoting procedures • schedule of licensed labour required • security factors • shape, colour and appearance • size, volume and footprint area.

RANGE STATEMENT	
Culture or holding system or facility may include:	• tanks, raceways and RAS • live holding systems • purging or depurating system • display tanks, aquaria and aquascapes (ornamental industry) • grow out facilities, hatcheries and nurseries • water supply and disposal systems for closed and semi-closed systems • pest, predator and disease control structures • harvested stock holding structures, tanks, bins and cages.
Work plans or schedules may include information on:	• contingencies for responding to partial or full system shutdown, stock stress or mortalities • contingency plan to address staffing and equipment supply problems • costs and budget details • date and time tasks are to be undertaken • designated jobs tasks, directions or designs • environmental impact control measures • expected time required to complete activities • hazard identification, risk assessment and risk control measures • local, state, territory and federal government regulations • location • maintenance schedule for particular items of equipment • manufacturer guidelines or instructions • materials, supplies, tools, equipment or other resources required • monitoring and reporting requirements and procedures, including logs or checklists • non-conformance or incident/fault reporting procedures • OHS procedures, including PPE requirements • order of activities • other members of work team and their roles, responsibilities and skills • pre- and post-operational and safety checks • preferred supplier list and resources required by external workers and tradespeople • routine maintenance procedures

RANGE STATEMENT	
	• specific structures or components • standard for completed activities • the person in charge.

RANGE STATEMENT	
Worksite may include:	• depots • hatchery, nursery, grow out and holding facilities • laboratories • post-harvest or processing facilities • staff amenities • stock and quarantine treatment facilities • storage areas • workshops.
Risks may include those associated with:	• environment • infrastructure, plant and equipment • OHS for staff, contractors and visitors • product quality and food safety • stock.
Environmental parameters may include:	• activity of pests, competitors and predators • light • turbidity • water flow • water level or depth.
Water quality parameters may include:	• alkalinity • BOD • chlorine or chloramines • dissolved carbon dioxide • dissolved oxygen • general water hardness • level of nitrogenous wastes, such as ammonia, nitrite and nitrate, and contaminants and pollutants • pH (acid/alkaline balance) • phosphates • redox potential • salinity or conductivity • temperature • total dissolved solids.
Contingency plans to address:	• adverse weather conditions and acts of nature, such as flood or fire • breakdown of components • bypass of components • compromised water source • disease outbreaks

RANGE STATEMENT	
	• emergency procedures • non-standard water quality parameters • risks to culture stock during emergency shutdowns or breakdowns • risks to environment • risks to infrastructure and equipment • risks to product quality and food safety.
Resource and supply provisions may include:	• machinery, equipment and materials, including welders (e.g. arc, gas and metal inert gas [MIG]), lathes, bench presses, multimeters and ohm meters, inspection pits, lifting and support equipment (e.g. jacks, overhead gantry and blocks), power tools (e.g. grinders and drills), and hand tools (e.g. spanners, hammers and screwdrivers) • workshop storage requirements, including racks for commonly used steel angle, rods, tube metal and wire, or boards for orderly placement of tools.
Records or reports may include:	• associated equipment and infrastructure • checklists, data sheets, inventory and stocktakes • culture or holding stock species • dates, times and progress against timelines of activities or events • details related to culture or holding structures or systems • electronic or hard copy • Gantt chart • graphs, charts and tables • KPIs • operation and maintenance details and other outcomes achieved • personnel and subcontractor performance data • problems experienced and strategies to overcome them.

Unit Sector(s)

Not Applicable

Co-requisite units

Co-requisite units		

Custom Content Section

Functional Area	

Functional Area

Functional Area	Aquaculture operations