



Australian Government

MSL977002A Troubleshoot equipment and/or production processes

Revision Number: 1

MSL977002A Troubleshoot equipment and/or production processes

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers ability to apply technical, instrumental and equipment knowledge and skills to troubleshoot testing equipment and testing issues related to production processes, identify problems and recommend corrective action.
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Application of the Unit

Application of the unit	This unit of competency is applicable to senior technical officers, laboratory supervisors and technical specialists working in all industry sectors. All operations must comply with relevant standards, appropriate procedures and/or enterprise requirements. Troubleshooting is the process of using technical knowledge and skills to investigate abnormal performance and assay results. This unit of competency includes troubleshooting testing equipment and testing issues related to production processes. In the case of chromatography, for example, these problems may be related to materials, such as laboratory solvents, procedures or equipment components, such as columns, injectors, pumps and detectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL976003A	<i>Evaluate and select appropriate test methods and/or procedures</i>

Employability Skills Information

Employability skills	This unit contains employability skills.
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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.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify abnormal equipment and/or process performance	1.1.Determine whether testing equipment is operating to manufacturer's specifications 1.2.Recognise whether equipment outputs are consistent with normal operation 1.3.Identify signs of equipment degradation and impending failure 1.4.Inspect equipment outputs to determine nature of the problem 1.5.Define nature of substandard performance
2. Identify causes of substandard performance	2.1.Select appropriate technical process for investigation 2.2.Identify causes using fact-finding processes, including interviews with appropriate personnel 2.3.Review maintenance records to ensure that system doesn't need simple maintenance 2.4.Review calibration records to ensure system is within calibration 2.5.Verify that the appropriate test procedure, materials and equipment were used 2.6.Conduct performance tests as appropriate to investigation 2.7.Analyse equipment and/or testing variables to develop list of possible causes 2.8.Isolate causes using appropriate elimination techniques
3. Recommend corrective action	3.1.Propose and trial corrective action based on investigation 3.2.Monitor trial data to ensure outputs are consistent with normal operation 3.3.Review trial results to confirm validity of corrective action 3.4.Maintain workplace records as required 3.5.Submit report summarising investigation and recommendations

Required Skills and Knowledge

Required skills include:

- troubleshooting testing equipment and testing issues related to production processes
- identifying causes of faulty or substandard performance
- proposing adjustments/rectifications/modifications
- testing results of adjustments/rectifications/modifications
- locating, interpreting and applying relevant information
- maintaining relevant workplace records
- identifying and safely handling products and materials
- applying safety precautions appropriate to the task

Required knowledge

Required knowledge includes:

- theoretical and practical aspects of laboratory equipment and processes
- principles and procedures of testing equipment operation
- characteristics, capabilities and limitations of testing equipment and its components
- troubleshooting procedures for testing equipment
- possible effects of matrix and impurities on analytical method
- troubleshooting procedures for production processes
- regulatory and licensing/testing requirements
- mathematical/statistical procedures for evaluation of test data
- enterprise requirements for problem investigation and reporting
- relevant health, safety and environment requirements

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 and evidence required to demonstrate competency in this unit

Assessors should ensure that candidates can:

- troubleshoot testing equipment and testing issues related to production processes to identify causes of problems and recommend corrective action
- identify causes of faulty or substandard performance
- propose adjustments/ rectifications/ modifications
- test results of adjustments/rectifications/modifications
- locate, interpret and apply relevant information
- maintain relevant workplace records
- identify and safely handle products and materials
- apply safety precautions appropriate to the task.

Context of and specific resources for assessment

This unit of competency is to be assessed in the workplace or simulated workplace environment.

This unit of competency may be assessed with:

- *MSL977001A Contribute to development of products and applications*
- *MSL977003A Contribute to validation of test methods.*
- *MSL977004A Develop or adapt analyses and procedures.*

Resources may include:

- standard laboratory equipped with appropriate equipment, samples, reagents and test methods
- laboratory procedures and SOPs.

Method of assessment

The following assessment methods are suggested:

- completion of a troubleshooting brief or a troubleshooting proficiency test
- review of workplace troubleshooting briefs completed by the candidate
- feedback from supervisors and/or clients
- oral or written questioning to assess underpinning knowledge of equipment operation, troubleshooting

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	procedures and problem solving techniques • simulated equipment failure scenarios. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. Manufacturing Emission spectroscopy is a technique often used by technicians to troubleshoot problems resulting from contamination. For example, a sample of stainless steel that showed signs of corrosion was submitted to a chemical technician for analysis. The technician subjected the sample to a spark and compared the spectra of the composite steel to spectra of a control sample of stainless steel. The technician concluded that the vanadium concentration in the sample was higher than that of the control sample. After doublechecking the work, the technician passed the results back to the engineering staff who were able to find the source of error and correct the manufacturing problem. Biomedical The immuno-analyser has become non-functional. The senior technical officer notifies the laboratory manager and then checks out the instruction sequence for that assay, checks the diagnostics for the detection unit, and reagent and sample lines, and then runs the diagnostic check program provided by the company. The officer

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concludes that the fault is due to instrument failure.

Food processing

A food company received a large number of customer complaints regarding the taste of its flavoured yoghurt product. The technician asked their sales representative to collect samples of the product from sales outlets while she/he collected retained reference samples with the same batch number/expiry date for examination. The technician developed a strategy for troubleshooting the production process and followed the following steps:

- analysis of the returned product and reference samples indicated that the sugar concentration was above specification in both, suggesting that an error occurred during manufacturing or packaging
- examination of batching sheets with the appropriate product code indicated that the correct formula and quantities of raw materials were used
- retention samples were re-analysed and indicated that all were within specification
- discussions with operators did not uncover any cause for the defect
- observation of the process indicated that a non-standard batching drum was being used
- discussions with the operator revealed that the tared standard drum used for weighing raw materials had been damaged and a lighter non-standard drum was being used with the original tare weight.

Analysis of the sugar content in the yoghurt indicated that the increased sugar content was due to the incorrect tare weight.

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.

Codes of practice

Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, codes, procedures and/or enterprise requirements

Standards, codes, procedures and/or enterprise requirements may include:

- Australian and international standards, such as:
- AS ISO 1000-1998 The international system of units (SI) and its application
 - AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
 - AS/NZS 2243 Set:2006 Safety in laboratories set
- AS/NZS ISO 10005:2006 Quality management systems - Guidelines for quality plans
- AS/NZS ISO 10012:2004 Measurement management systems - Requirements for measurement processes and measuring equipment
 - AS/NZS ISO 14000 Set:2005 Environmental management standards set
 - AS/NZS ISO 9000 Set:2008 Quality management systems set
 - ISO 5725 Accuracy (trueness and precision) of measurement methods and results
 - ISO/IEC Guide 98-3:2008 Uncertainty of measurement - Part 3 Guide to the expression of uncertainty in measurement (GUM)
- Eurachem/CITAC Guide CG4 Quantifying uncertainty in analytical measurement
- Australia New Zealand Food Standards (ANZFS) Code

RANGE STATEMENT

	• Australian code of good manufacturing practice for medicinal products (GMP) • calibration and maintenance schedules • enterprise recording and reporting procedures • equipment startup, operation and shutdown procedures • gene technology regulations • material safety data sheets (MSDS) • material, production and product specifications • National Association of Testing Authorities (NATA) Accreditation programs requirements • National Health and Medical Research Council (NHMRC) Guidelines • national measurement regulations and guidelines • occupational health and safety (OHS) national standards and codes of practice • principles of good laboratory practice (GLP) • production and laboratory schedules • quality manuals, equipment and procedures manuals • standard operating procedures (SOPs) • Therapeutic Goods Regulations 1009
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing
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Competency field

Competency field	
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Co-requisite units

Co-requisite units		