



Australian Government

Department of Education, Employment and Workplace Relations

PMAOPS751A Apply physiochemical knowledge to select raw materials for surface coatings

Release: 1

PMAOPS751A Apply physiochemical knowledge to select raw materials for surface coatings

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	<p>This competency covers an overview of the raw materials and their properties used in surface coatings and their contribution to the final properties of the coating.</p> <p>This competency would typically be required by a person with a technical background needing to acquire knowledge and skills in the surface coatings manufacture and applications area.</p>
------------------------	---

Application of the Unit

Application of the unit	<p>This competency applies to technicians, senior technical officers, laboratory supervisors and research and development personnel requiring a firm foundation in the correct use of raw materials for surface coatings.</p> <p>It includes:</p> <ul style="list-style-type: none">• formulating• selection of raw materials• manufacturing applications• raw material calculations• environmental aspects of raw material usage• restrictions of use of raw materials for surface coatings• cost variables• identify toxic raw materials and their relevant use
--------------------------------	--

Licensing/Regulatory Information

Not applicable.

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. Apply knowledge of polymers to surface coating properties.	1.1. Predict coating properties related to nature of polymer base. 1.2. Calculate the molecular weight of a polymer. 1.3. Distinguish between the characteristics of solution emulsion and dispersion polymers. 1.4. Identify the effects of monomer selection on product properties.
2. Select resins for surface coatings.	2.1. Distinguish between the characteristics and uses of surface coating resins 2.2. Select a resin for a typical end use.
3. Select additives for surface coatings.	3.1. Identify the principal additives used in coatings 3.2. Distinguish between the characteristics and uses additives 3.3. Select an additive for a typical end use.
4. Design a solvent system for surface coatings	4.1. Identify the role and behaviour of solvent types and their properties. 4.2. Select solvents which may be suitable for an application. 4.3. Recommend a solvent system by applying solvent system design principles and solubility parameters.
5. Select pigments for a surface coating.	5.1. Balance the relationship between particle size, gloss and opacity to achieve required outcome. 5.2. Distinguish between organic and inorganic pigment. 5.3. Identify applications for TiO ₂ pigments. 5.4. Evaluate the need for the use of anti corrosive pigments. 5.5. Verify the need for extenders 5.6. Select a pigment combination for a typical application.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills

This competency includes the following skills:

- analysis
- selection
- discrimination
- maths

Required knowledge

Competence in this unit includes the following knowledge:

- chemistry of raw materials
- material safety data sheets
- aware of OHS requirements
- calculate the molecular weight of a polymer to determine the effects on the end product
- polymers used in surface coatings and their impact of the surface coating properties and applications
- the importance and impact of polymer functional groups
- properties and applications of resins
- the manufacturing techniques of alkyd resins
- the effects of additives on the final properties of surface coatings
- safety and environmental concerns in the use and handling of solvents
- glass transition temperature of polymers and film forming mechanisms
- the principles of emulsion polymerisation
- the different types of resins used in the surface coatings
- the effects of additives on the final properties of surface coatings
- the role and behaviour of solvents
- the process of solvent evaporation used in formulating
- the functions of pigments
- reasons for the use of inorganic and organic pigments
- key differences between organic and inorganic pigments
- the performance properties of TiO₂ pigments.
- the use of anti corrosive pigments.
- the role and properties of extenders
- overall, the reasons for the selection of raw materials when used in surface coatings.

Evidence Guide

EVIDENCE GUIDE	
<p>The Evidence Guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for the Training Package.</p>	
<p>Overview of assessment</p>	<p>Assessment of this unit should include demonstrated competence on actual plant and equipment in a work environment. The unit will be assessed in as holistic a manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.</p> <p>Simulation may be required to allow for assessment of parts of this unit. Simulation should be based on the actual plant and will include walk-throughs of the relevant competency components. Simulations may also include the use of case studies/scenarios and role plays.</p> <p>This unit of competency requires a significant body of knowledge which will be assessed through questioning and the use of what-if scenarios both on the plant (during demonstration of normal operations and walk-throughs of abnormal operations) and off the plant.</p>
<p>Critical aspects for assessment and evidence required to demonstrate competency in this unit</p>	<p>Competence must be demonstrated in the ability to formulate an appropriate surface coating using correct raw materials. In particular:</p> <ul style="list-style-type: none"> • correct selection and detailed use of relevant raw materials • formulate a coating to customer's requirements • understand the use of raw materials. • describe the impact of certain raw materials on the environment
<p>Context of and specific resources for assessment</p>	<p>Assessment will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability over a range of situations. A bank of scenarios/case studies/what-ifs will be required as will a bank of questions which will be used to probe the reasoning behind the observable actions.</p>
<p>Method of assessment</p>	<p>In all plants it may be appropriate to assess this unit concurrently with other relevant units.</p>
<p>Guidance information for assessment</p>	<p>Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.</p>

Range Statement

RANGE STATEMENT	
<p>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 italicized wording, if used in the Performance Criteria, is detailed below. Add any 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.</p>	
Codes of practice/ standards	Where reference is made to industry codes of practice, and/or Australian/international standards, the latest version must be used.
Context	This competency applies to the formulation of surface coatings using relevant raw materials.
Surface coating resins	<p>Surface coating resins include:</p> <ul style="list-style-type: none"> • synthetic resins with drying oils. • alkyd resins • modified alkyd resin • epoxy resins. • saturated and unsaturated polyester resins. • vinyl resin solutions. • thermosetting acrylic resins. • phenolic resins.
Characteristics and uses of resins	<p>Characteristics and uses include:</p> <ul style="list-style-type: none"> • chemistry • structure • physical and chemical properties relevant to surface coating • modification reactions as relevant (eg alkyds)
Surface coating additives	<p>Surface coating additives include:</p> <ul style="list-style-type: none"> • cellulose • nitrocellulose • cellulose esters, and • cellulose ethers.
Characteristics and uses of additives	<p>Characteristics and uses include:</p> <ul style="list-style-type: none"> • nature • structure • properties • uses
Procedures	All operations are performed in accordance with procedures. Procedures include all relevant workplace procedures, work

RANGE STATEMENT	
	<p>instructions, temporary instructions and relevant industry and government codes and standards. These may include:</p> <ul style="list-style-type: none"> • batch cards • manufacturing instructions • product data sheets • material safety data sheets (MSDS) • quality management systems • OHS procedures and policies
Health, safety and environment (HSE)	<p>All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence.</p>

Unit Sector(s)

Unit sector	Operational/technical
--------------------	-----------------------

Competency field

Competency field	
-------------------------	--

Co-requisite units

Co-requisite units		
---------------------------	--	--