Plastics, Fibre Reinforced/Composites

Activity scope

This document relates to working with Fibre-Reinforced Plastics as a curriculum activity. ‘Fibre-reinforced plastics’ refers to the process of adding fibre material to thermoset resin to produce strength and stability.

Special considerations

**Activities involving fibre-reinforced plastics should be restricted to senior secondary school students.** Where possible, consider alternatives. With polyester resins, methyl ethyl ketone peroxide (MEKP) is commonly used as a catalyst for airing the resin, the most common application being in:

- glass fibre – reinforced plastic articles
- clear casting polyester resins
- polyester filler pastes, which might be used in the automobile body repair industry.

Methyl ethyl ketone peroxide (MEKP) is considered a hazardous material by Australian standards and should only be used in the presence of a person who is conversant with its properties and experienced in its use. The concentration of MEKP varies with time and this may lead to the formation of an unstable, explosive product. Aged MEKP should be handled with extreme caution and be disposed of by trained personnel.

Criteria for using MEKP in schools include:

- purchasing only sufficient quantities for current needs
- disposing of stock on hand at the end of each school year in an approved manner
- minimising the risk of contamination by purchasing stock in small containers
- recording the date of receipt on each container
- not mixing the contents of different containers of MEKP
- not storing MEKP in the flammable liquids cupboard.

Minimum activity-specific qualifications for supervisors

- For a registered teacher with qualifications in Industrial Technology and Design (ITD), competence (demonstrated ability) in the preparation and use of fibre-reinforced plastics and other thermoset resins.
- For a leader other than a registered teacher, industry experience.

Minimum activity-specific equipment/facilities

- Completed risk assessment for *Managing a Practical ITD Workspace*
- Work benches covered with disposable sheeting.
- Eye wash facilities.
- Safety glasses and appropriate fully-enclosed footwear that protects against falling sharp tools, equipment or project materials.
- Chemical resistant gloves.
- Full-length trousers and long-sleeved shirts are recommended.
- Ensure adequate ventilation to prevent inhalation of fumes.
- Emergency stop buttons on equipment where required.
- Properly installed guards and safety devices on all equipment where necessary.
- Appropriate personal protective equipment or clothing (e.g. respiratory equipment or face masks). This should prevent the inhaling of chemicals associated with this activity (e.g. acetone, catalyst and resin fumes).
- Protective clothing (e.g. disposable gloves) is essential because resins are dangerous if absorbed through the skin.
- Full arm and leg coverage is recommended to protect skin from burns due to contact with uncured resin.
- Use disposable gloves when handling resin chemicals and methyl ethyl ketone peroxide (MEKP).
- Provide personal hearing protection, as appropriate, and training for staff in the correct use and storage of the hearing protection.
- Appropriate and sufficient waste containers.

Activity-specific hazards/risks and suggested control measures
- Ensure Managing a Practical ITD Workspace risk assessment is followed.
- Dust from certain plastics may be harmful if inhaled and may cause irritation to the skin and eyes. Sanding machines should be fitted with dust-extraction equipment where it is considered appropriate.
- Toxic fumes given off by heated and thermosetting plastics, such as PVC, are a health hazard and steps should be taken to prevent their being inhaled. Adequate ventilation of the area used for this process should be provided.
- Plastic solvents are injurious if inhaled and steps should be taken to minimise this possibility.
- Ensure that adequate ventilation is available during sanding, painting and gluing, especially when materials are used that release fumes during use, such as contact adhesives, paints, solvents and glues.
- Ensure that there is sufficient free space in the vicinity of the oven or heating devices to allow easy transportation of hot materials from the oven to the forming jig.
- Ensure that the handling of materials, such as MEKP, is performed by instructors only.
- Ensure that syringes are not used for dispensing MEKP.
- Ensure that material contaminated with solvents is removed from the work area and stored in a place where evaporation of the solvents may take place safely. The resulting residue material may be disposed of through the normal school rubbish channels to ensure the absorbent material does not create further hazards.
- For large spills of resin, a controlled pre-treatment of the captured contaminated resin will convert the spill to solid resin which can be disposed of through authorised school rubbish channels.
- Empty containers retain vapours and product residue and therefore are potentially explosive and/or may contain toxic vapour hazards.
- Ensure that fire precautions are taken regarding resins and acetone and that an appropriate fire extinguisher is provided. A suitable fire extinguisher and a fire blanket should be placed in close proximity to the working area.
- Store acetone correctly (refer to MSDS). It is a highly flammable liquid. Avoid the use of naked flames, as a catalyst burns fiercely if ignited.
- Advise students to use appropriate skin creams before and after engaging in this activity, because acetone is a severe de-fatting agent, which could result in skin irritations or infections.
- The resin product is a hazardous waste because of its characteristic of ignitability and therefore disposal of remains and spillage should be in an authorised landfill. Contact between catalysts and skin should be avoided as it will cause a delayed chemical burn.
- Fibreglass mat dust, acetone and catalyst can cause irritation to the eyes, lungs, skin and upper respiratory tract. Steps should be taken (such as the wearing of appropriate personal protective equipment) to ensure they are not inhaled.
- Commercial organic peroxides are combustible substances and are also very corrosive. It is recommended that they are only used in the senior section of the school.
- Ensure that all teachers involved in the activity are familiar with the contents of the MSDS of the products being used.
- Store all chemicals correctly to ensure that no fire or chemical reaction can occur.
- Mix chemicals in the proportions set down by the manufacturer’s specifications and measure them with appropriate devices.
- If a large spillage of acetone occurs, all students should be removed immediately from the area until complete evaporation and ventilation can be effected.
- Ensure that medical assistance is obtained as quickly as possible for cases of inhalation of fumes, oral ingestion and/or skin absorption of potentially toxic chemicals.
- Ensure that persons who have respiratory ailments or other at-risk ailments have ready access to medication.
- Establish emergency procedures for safe handling of MEKP including the following:
  - for splashes of peroxide on to the skin – wash with soap and water...
• for splashes of peroxide into the mouth – rinse out with water and drink plenty of water
• for splashes of peroxide into the eyes – thoroughly rinse out with water immediately. Hold eye open and irrigate from inner eye outwards.

• Minimise the number of students working at one time.
• Ensure that loose jewellery and clothing is secured or removed and long hair is tied back.
• Check equipment for damage before lesson.
• Ensure that all guards are correctly adjusted and securely fixed before beginning operations.
• Ensure that all solvents are stored in a well-ventilated cupboard away from direct access by all students.
• Ensure that the buffing mop is in sound condition, is suited to the job to be performed and is properly and firmly secured to the spindle.

Useful activity-specific links

• Health and Safety; Noise
• Hearing Protection Fact Sheet
• Managing a Practical ITD Workspace — Curriculum Activity Risk Assessment Guidelines
• Managing noise and preventing hearing loss at work Code of Practice 2011
• Quick reference guide for specified electrical equipment
• Standard Operating Procedures for Education Queensland sites