**Manchester Interdisciplinary Biocentre - Risk Assessment Form**

**BDS Fuels**

TUOM_4COL

| **Date:**  27/07/2016 | **Assessed by**:  Helen Toogood/Shirley Tait | **Validated by**:  Tanya Aspinall | **Location**: MIB, 3.051 | **Review date:**  27/07/2017 |
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| **Task**:  Use of Anaero Technology continuous flow fermenter for culturing bulk production of cells and cell products e.g. propane gas (GM assessment NSC 1614). The culture of bacteria will be harvested continuously into secure containers, and all gas products will be disposed of using the building ventilation system. |
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| **Activity** | **Hazard** | **Person(s) in danger** | **Existing measures to control risk** | **Risk rating** | **Result** |
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| Operating the fermenter | Electricity - electrocution | Operator | The fermenter is located in 3.051 and a sign is placed when in use to warn users not to touch moving metal parts.  Operate the fermenter cycles according to the manufacturers recommended guidelines. Annual PAT testing of electrical equipment. | LOW | A |
| Moving parts | Crushing or catching injury | Operator | A detailed SOP document/user manual must be read and followed by the operator, and full training given prior to use of the fermenter. When the feed cycles are running (2-6 times per day), some external parts move imperceptively. The equipment has a built-in safety jamming release feature (a pin snaps). A sign will be placed to warn users of this with instructions not to touch these parts during operation. | LOW | A |
| Heating the fermenter | Heat | Operator | Each fermenter reservoir is fitted with a heat jacket. This jacket is designed with two layers of insulation to prevent burn injuries if touched. Normal working temperatures will be 30-37ºC. | LOW | A |
| Assembling the fermenter | Working from height and physical strain injury from lifting heavy loads | Operator | To assemble all the fermenter heads onto the equipment, operators should work in pairs and use the appropriately provided safety stools when lifting and installing the equipment.  Follow the manufacturers SOP document when assembling the equipment. Operator training in manual handling. | LOW | A |
| Loading the fermenter | Pumping fluids under pressure | Operator and surrounding area | Fill the 25 L medium storage container while it is attached to an approved trolley for transportation. Follow the manufacturers SOP document when pumping the media into the fermenter syringes and/or the main fermenter reservoir(s). | LOW | A |
| Inoculation | Small amount of back-pressure | Operator | When the impeller drive is running, if an inoculation is required, there exists a risk of back-pressure. Shut down the impeller drive prior to inoculation (built into the software). | LOW | A |
| Inoculation | Needle prick | Operator | Handle sharps with care and dispose of in sharps bin. | LOW | A |
| Inoculation | Ethanol burn | Operator | Ports are flamed with 100% ethanol prior to inoculation. Ethanol is stored in a small quantity, enough for an inoculating port. Ensure all ethanol has burned and port is cooled before inoculating. Separate COSHH form for ethanol must be read and signed before use, and the identified control measures must be followed. | LOW | A |
| Culture Growth | Chemical hazard | Operator | All hazardous chemicals such as the addition of an antibiotic e.g. ampicillin and chloramphenicol for bacterial resistance, must have accompanying COSHH assessment(s), and the identified control measures must be followed. | LOW | A |
| Culture Growth | Biological hazard | Operator | All accompanying BioCOSHH or GM assessment forms for bacterial growth must be in place and authorised prior to fermenter run being undertaken. | LOW | A |
| Cleaning the fermenter | Mechanical injury from impeller drive | Operator | Switch off all electrical connections prior to cleaning. | LOW | A |
| Gas production | Flammable gas explosion | Operator and people in the surrounding area | Propane gas is highly flammable, so there is a possibility of a flammable atmosphere being formed. However, at the scale that we are intending to do the work, it is extremely unlikely (<50 mg). To avoid a flammable atmosphere being produced, all gas outputs will be vented directly into the building ventilation systems. | LOW | A |
| Harvesting | Biological hazard | Operator and surrounding area | The fermenter runs on a continuous flow basis, with regular automated harvesting into large containers. The fermenter has a maximum liquid capacity of 46 L contained within the 4 feed syringes and two digesters. It contains 2 splash trays for feedstock release with drain plugs. The base unit contains a 50 L bund container with drain plugs in case of spillage. The total containment of fluid built into the system is 62 L. The waste outlet contains safety valves and a U-bend system of pipes to prevent accidental discharge. Waste containers should contain virkon powder for sanitisation of the waste culture, and should be housed within spill trays. Waste containers should be of sufficient volume, and changed periodically, to prevent overfilling or spilling of the contents into the lab. If spills and leaks from the fermenter occur outside this containment, they must be controlled by the MIB spill kits located on communal 3rd Floor Lab corridor and follow spill procedures – report all spills to MIB BSO. | LOW | A |
| Cleaning the fermenter | Physical strain injury from lifting heavy load | Operator | Operator training in manual handling; team lifting if needed. | LOW | A |
| Cleaning and sterilisation | Biological and chemical hazard | Operator | Post-run, virkon is used to sterilise any hazardous waste contained in the stainless steel vessels. The fermenters are flushed twice with caustic soda and distilled water and sterilised in-situ with peracetic acid.  Separate COSHH form for virkon, caustic soda and peracetic acid must be read and signed before use, and the identified control measures must be followed. | LOW | A |

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| **Authorisation by PI**  **I confirm that I have considered and understand the experiment and the associated hazards. I am satisfied that all of the hazards have been identified and that the control measures to be followed will reduce the risks to acceptable levels.**  **Print name: Nigel Scrutton Signed:**  **Date:** |

**Declaration by researcher**

**I confirm that I have read this Risk Assessment and that I understand the hazards and risks involved and will follow all of the safety procedures stated.**

**Declaration by PI**

**I confirm that the researcher who has signed below is competent to undertake the work. My counter-signature indicates that I am happy for the work to proceed.**

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| **Name (please print)** | **signed** | **PI countersignature** | **date** |
| Helen Toogood |  |  |  |
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**Notes to accompany General Risk Assessment Form**

**This form must be completed for every experimental procedure conducted within the MIB.**

**The form must be signed by the researcher and their PI before the work starts.**

1. **Date**: Insert date that assessment form is completed.
2. **Assessed by**: Insert the name of the assessor.
3. **Validated by**: Insert the name of someone in a position to validate that the assessment has correctly identified hazards and addressed the risks (eg. the PI or an MIB H&S officer).
4. **Location**: insert details of the exact location - floor and laboratory area.
5. **Review date**: insert details of when the assessment will be reviewed as a matter of routine (maximum 1 year). \*\* The assessment must be reviewed if there are any significant changes to the work activity, the vicinity, the people exposed to the risk, etc.
6. **Task**: insert a brief summary of the task.
7. **Activity**: describe the activities involved in the task. Eg. use of gas cylinders, use of fume cupboard, use of computer or other electrical equipment, use of lab ovens, etc.
8. **Hazard**: for each activity, list the hazards. Assessment of simple chemical risks (eg. use of cleaning chemicals in accordance with the instructions on the bottle) may be recorded here. More complex COSHH assessments, eg. for laboratory processes, should be recorded on the specific COSHH forms and attached to this risk assessment form.
9. **Persons in danger**: insert everyone who might be affected by the activity. Remember those who are not immediately involved in the work, including cleaners, inexperienced lab workers, young persons on work experience, maintenance contractors, Estates personnel, etc.
10. **Existing measures to control the risk**: list all measures that already mitigate the risk. A standard operating procedure or local rules (eg for work with ionising radiation, lasers or biological hazards) will often address risks. Some specific hazards may require detailed assessments in accordance with specific legislation (eg COSHH, DSEAR, manual handling, DSE work). Where this is the case, and a detailed assessment has already been done in another format, the master risk assessment can simply cross-reference to other documentation. For example, the activity might be use of a carcinogen, the hazard might be exposure to hazardous substances, the existing control measures might all be listed in a COSHH assessment. Controls might also include use of qualified and/or experienced staff who are competent to carry out certain tasks.
11. **Risk Rating**: Insert result – L, M or H

* **L = trivial risk**. Identifies low risk activities; it is unlikely that harm would arise under the controlled conditions listed, and even if exposure occurred, the injury would be relatively slight.
* **M = adequately controlled, no further action necessary.** The control measures currently in place offer adequate protection, and all legislative requirements have been met (and University policies complied with).
* **H = high risk, actions required**. The current control measures do not provide adequate protection. An action plan is required, which details the further control measures that must be implemented in order to bring the risks to an acceptable level

1. **Result** : T, A, N or U:

**T = trivial risk**. Use for very low risk activities to show that you have correctly identified a hazard, but that in the particular circumstances, the risk is insignificant.

**A = adequately controlled, no further action necessary.** If your control measures lead you to conclude that the risk is low, and that all legislative requirements have been met (and University policies complied with), then insert A in this column.

**N = not adequately controlled, actions required**. Sometimes, particularly when setting up new procedures or adapting existing processes, the risk assessment might identify that the risk is high or medium when it is capable of being reduced by methods that are reasonably practicable. In these cases, an action plan is required. The plan should list the actions necessary, who they are to be carried out by, a date for completing the actions, and a signature box for the assessor to sign off that the action(s) has been satisfactorily completed. Some action plans will be complex documents; others may be one or two actions that can be completed with a short timescale.

**U = unable to decide. Further information required.** Use this designation if the assessor is unable to complete any of the boxes, for any reason. Sometimes, additional information can be obtained readily (eg from equipment or chemicals suppliers, specialist University advisors) but sometimes detailed and prolonged enquiries might be required. Eg is someone is moving a research programme from a research establishment overseas where health and safety legislation is very different from that in the UK.

**For T and A results**, the assessment is complete.

**For N or U results**, more work is required before the assessment can be signed off.

1. **Authorisation**. **Signature of principal investigator:** the PI must sign and date the assessment, to confirm that they have considered and understand the experiment and the associated hazards, and that they are satisfied that all of the hazards have been identified and that the control measures to be followed will reduce the risks to acceptable levels.
2. **Declaration by researcher**: the researcher must sign and date the assessment to confirm that they have read this Risk Assessment and understand the hazards and risks involved and will follow all of the safety procedures stated.
3. **Declaration by PI:** the PI must countersign by each name to confirm that the researcher is competent to undertake the work, and that they are happy for the work to proceed.