BIOdiesel TechNOTES

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BIODIESEL LABORARTORY BEST MANAGEMENT PRACTICES Managing a small biodiesel facility and testing lab

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The University of Idaho has been producing biodiesel in batch reactors for over 30 years. Throughout that time our testing lab has been crucial in improving our process and maintaining a quality fuel for use in UI vehicles and in other research activities. This TechNote will provide some guidelines on proper management of a small facility and will list some mistakes and how to avoid them.

1. Safety

Above all is personnel safety – the individuals working in the lab are the most valuable and precious resource and it behooves the manager to adhere to all relevant safety precautions. Please read TechNote #8 Safety Concerns for Biodiesel for more detailed information and for resources on this topic.

2. Secondary containment

The area surrounding the reactor should have secondary containment. You may have several drums and tanks of various sizes; the containment area needs to be able to hold at least the volume of the largest vessel. To meet this requirement at the UI, a 2 ½" high by 5 ½" wide berm of vinyl with a foam rubber insert was glued to the floor to surround the area in question. This berm can be driven over with a forklift and will spring back to its original shape.

If you are dealing with 55 gallon drums, a barrel dolly and drum lifter/grabber (used with a forklift) are needed for safe lifting and moving.

3. Proper motor selection and ventilation

Electric motors on pumps and mixers should be explosion proof. Pneumatic and/or hydraulic pumps and mixers are also safe and can be a less costly option. (Please see NEC code 500.5 for more technical information)

There should be ample ventilation and the reactor should be closed and pressurized or contain a methanol condenser. The recommended ventilation rate for a laboratory is a minimum of 6 room air exchanges per hour. There are many standards that cover lab ventilation including OSHA 1910.145 (Occupational Exposure to Hazardous Chemicals) and ANSI Z9.5 (Laboratory Ventilation). (Please see these references for more detailed information)

4. Taking care of the lab

Organize the lab so that it works for everyone. Declutter on a regular basis in order to maintain only what is needed so that work can be carried out smoothly and efficiently. Post Material Safety Data Sheets conspicuously for easy access by technicians and inspectors.

Take care to update, calibrate and repair instruments when needed in order to retain their integrity. Regular instrument calibration happens to be one of the most overlooked lab procedures. Data is only as good as the equipment and the operator using it. Remember to back-up computer systems, preferably automatically on a daily or weekly basis. Additionally, a log of any work or

repairs done for each instrument should be kept in order to stay current on maintenance and to alert future technicians of work history.

Post standards and procedures at each station for someone to follow. Lab assistants must be well trained on the proper use of instruments and equipment for their specific application throughout the facility in order to keep them safe and to protect the valuable hardware.

Use nitrile examine gloves and work in the fume hood when possible, especially with flammable liquids or a combination of reactive chemicals. Test the air flow to see that the face velocity is between 80 and 100 fpm at a height of 17". At this rate heat and fumes will be safely carried out of the building.

Make use of a label maker, it is a valuable tool for providing semi-permanent markings that can easily be read by anyone in the lab to identify the contents of cabinets, drawers, sample jars and bottles. Labels should also be used to prominently display the tech-help number on each piece of equipment so that issues can be dealt with promptly.

A binder or file of all the suppliers with contact information and routine orders listed is a good way to improve efficiency in ordering and tracking orders. Additionally, an inventory of chemicals, spare parts and other supplies should be kept up to date in order to avoid delays and/or overstocking.

Each person working in the lab should have his or her own lab notebook that should used to record data, observations, problems or malfunctions throughout the day or at the end of the day to track progress and for future reference. Some people prefer to enter this kind of information directly into the computer which is great as long as it is backed-up regularly.

Pitfalls

Don't get too complacent about procedures. It is easy to get into a routine that may incorporate a shortcut here and a shortcut there until the integrity of the process is lost and accuracy suffers.

Don't bias the process or data in favor of the hypothesis while at the same time thereis no reason to despair over or disregard a failed experiment. There may be a hidden treasure in what did not go right.

Do not walk away from an experiment that could potentially go haywire. It is best to have at least two people available during sensitive or potentially dangerous experiments so that at least one person is in the lab at all times.

Eating lunch and/or snacks in the lab is not a good idea due to possible contamination of samples or worse, the ingestion of something toxic by the technician. This should be done in a designated break area away from chemicals and fumes.

Do not rely on memory to be able to put off entering data or writing down an observation. Numbers are easily reversed and some subtle reflections can be lost.

Do not mark samples or substances of any kind in cryptic notation that cannot be remembered or deciphered by others. It is possible to have samples dating back several years and being able to identify them is important in order to tie them to an ongoing experiment or to toss them out.

Do not assume anything, the consequences of which are clearly spelled by the very word – assume.