GENERIC PROTOCOL

CONDUCTING A SAFETY WALK-THROUGH ON A FARM: HAZARDS OF THE MANURE HANDLING SYSTEM, ANAEROBIC DIGESTER, AND BIOGAS HANDLING SYSTEM

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INTRODUCTION

This protocol is intended to be used by health and safety experts and those with expertise in anaerobic digesters/systems. It was adapted from basic elements of both traditional job hazard analysis and process hazards analysis (particularly hazard and operability analysis) techniques, and is intended to overcome some of the limitations of both methods for someone conducting a site walk-through consisting of less than one day of available time.

The generic protocol cannot, by its very nature and time constraints, produce the depth and wealth of detail possible by conducting full analyses of both jobs and processes; however, it provides a fairly comprehensive first cut of significant hazards and risks:

- observations of control measures already in place, missing items, and whether such measures are working, in use, or out-of-service/needing maintenance,
- valuable information concerning accident/injury/symptom histories, and
- employees' observations of their tasks and processes and their opinions concerning their risks (also useful for determining training needs and emphasis).

For this protocol, interaction with process staff is necessary and critical -- thus some ground rules are included to help this move smoothly. The analyses from which the protocol was derived are structured, yet creative, tools which turn employees' knowledge and experience into a valuable and decided advantage for doing workplace assessments. As staff become more experienced on the job, they have seen the same workplace so often that they don't really "see" it anymore. They can overlook hazards and risks because of their familiarity. By providing some structure to facilitate your interaction with them, you can draw them out and help them to recognize things they do and experience, yet may not realize that they know.

ESTABLISH SOME GROUND RULES

The following are some suggested ground rules for site investigations:

- Hazard analysis is a cooperative activity.
- You need workers to perform their jobs as usual so that you can study the job.
- Reassure employees that you will be scrutinizing the jobs and processes, not checking up on their performance.
- Explain that you will be involving them in all phases of the analysis and that you welcome their input. Be respectful of their opinions and contributions.
- You need to arrange with the owner the most appropriate time to get the majority, if not all, of the personnel together for the site visit.

START WITH GOOD PROCESS INFORMATION

Obtain, or sketch your own, process layout or process flow diagram. This can be composed of blocks and arrows or can use sketches of the tanks, piping, pumps, etc. Either way, obtain information on sizes of these items such as dimensions of tanks; capacity of ventilation fans, etc.. If a diagram is provided, trace it and check it for completeness. Is it an accurate representation of the actual process' equipment and devices? It may be outdated or not represent the way the process currently operates or should operate. Keep in mind that modifications are often made as processes are adapted to local situations and as trial and error necessitates changes.

OBSERVE AND TRACE THE PROCESS STEPS AND DESCRIBE THE BASIC FUNCTION OF EACH STEP

These are some expected steps. You should describe the process of materials handling and materials flow for all the solids, liquids, and gases:

1. manure collection,
2. addition of other digester feedstocks (Is anything else fed to the digester?),
3. anaerobic digester,
4. solids separation/dewatering (The solids may go to storage; where does the liquid go?)
5. biogas produced by the digester may be piped to:
    a. immediate use for heat or electricity generation
    b. storage or compressed for storage
    c. disposal by combustion (such as a flare)

DETERMINE THE JOBS/TASKS FOR EACH STEP AND THEIR HAZARDS

For each of the process steps, determine the jobs/tasks and their hazards:

1. <u>For the typical operation</u> of that step. Inquire also about unusual or infrequently done procedures.
2. <u>For process failures</u> of that step and for responses to failure (include operator error, vandalism, theft, fire). Some process failure modes to consider may include:
    a. Process not working at all. For example, if the step involves biogas being sent to the flare, what if the flare has gone out, because there is no flow to the flare?
    b. Process is doing more of something than it should. For example, if the step involves sending some other material to the digester, what if too much material is being sent to the digester?
    c. Process is doing less of something than it should. For example, if the step involves sending biogas to a generator and the generator goes on and off intermittently?
    d. Can the process leak anywhere, in an inward direction or an outward direction?
    e. Can the process operate in reverse? For example, if biogas is being conveyed to the flare, could the flame go back down the pipe toward the digester?
    f. Can the process experience a substitution? For example, could an entirely different material be sent to the digester in place of an expected feedstock?
3. <u>For the typical maintenance</u> needed for that step. Inquire also about unusual or infrequently done procedures, and include confined space entry, lockout or powering-down of equipment, linebreaking or other isolation techniques.

For each of these kinds of tasks in items 1,2,and 3 above, imagine and ask about hazards and risks. Some typical questions and concerns may include:

a. Is there any potential for fire, explosion, overpressurization, corrosion, sudden equipment failure?
b. Can the worker be injured reaching over or being near moving machine parts?
c. Are there fixed objects, such as sharp edges, that might cause injury?
d. Is the worker required to make movements that could cause hand or foot injuries, repetitive motion injuries, or strain from lifting?
e. Do environmental hazards (dust, chemicals, radiation such as welding rays, heat/cold including burns, or excessive noise) result from performing the job? Are the exposures fairly continuous or are there peak exposures? Are exposures extensive due to overtime or changes in production rates? Are exposures due to confined space entry? Is there any stress such as from shiftwork or scheduling?
f. Propose to employees how hazards could arise or give examples of potential scenarios (based upon actual cases, where possible), and ask about/observe any control measures in place which could prevent such incidents or reduce their impact.

4. Ask about any history of accidents or incidents or symptoms (include near-misses).
5. Observe and ask about the possible impact of nearby operations or overall layout (including the flow of the work, such as from step to step). Hazards may arise from items or processes being in close proximity to each other.

LIST AND DESCRIBE THE NATURE OF THE HAZARDS FOUND

For each of the hazardous tasks or problems found, describe the nature of the problem, adverse outcome, injury, or disaster experienced or possible.

EVALUATE THE HAZARDS FOUND

For each hazardous task or problem found, evaluate its seriousness for producing accident, injury, overexposure, or physical hazard.

1. How serious is the hazard? Are there any regulations or well-respected recommendations which could be used to determine this? (Note that many regulations, such as those of OSHA, may not apply to agriculture but may still be useful in an advisory capacity.)
2. What control measures are in place? Are they working properly, adequate, or in place but not being used? Is the hazard being sufficiently addressed by these items?
   a. Engineering controls, such as ventilation, guards or enclosures
   b. Personal protective equipment, such as respirator, goggles, gloves, vaccination
   c. Administrative controls:
      - Job rotation plans
      - Work practices and procedures: a<u>ny in writing</u>? Include those for confined space entry, lockout or powering-down of equipment, linebreaking or other isolation techniques.
      - Signage
      - Monitoring (e.g. air, medical, noise, etc.)
      - Training.

3. Discuss your hazard evaluation with the people who do the work. Employees' observations and opinions concerning their risks can not only provide valuable information in themselves, but can also be very useful for determining training needs and emphasis.
4. It may happen that there is insufficient information to evaluate the seriousness of the hazard. Obtaining more information may require such things as implementing a more detailed analysis or conducting air sampling, noise sampling, biological sampling, or medical surveillance.

RECOMMEND SAFE PROCEDURES AND PROTECTION

For each hazard found and the control measures in place, propose any necessary changes, additions, modifications. You may find that more than one option is available and be able to rate these alternatives for effectiveness, ease of use, likelihood of people using them or following procedures.

- Ideally, you will eliminate the source of the hazard; such as by redesigning equipment, changing tools, installing ventilation, isolating the machine, or adding machine guards.
- If the hazard can't be eliminated, you will reduce it as much as possible by using personal protective equipment, improving procedures, or using other administrative controls.
- Communicate your recommendations to the staff for feedback and comment (including feasibility).

IMPLEMENTATION OF PREVENTIVE MEASURES

Put in place the new or modified procedures and protections. Depending upon what these turn out to be, you may need to:

- List each new step in the changed procedure and train the worker in the newer, safer methods.
- Train the worker on proper use of personal protective equipment, donning and doffing, care and cleaning, maintenance, replacement, etc.
- Train the worker on new engineering controls, how to know if they are not working properly, and how to perform maintenance safely on these items.
- Expect and address feedback from workers. Keep in mind that ideas may need refinement in the field, based upon trial and error. Solutions that seem good in theory or on paper may be quite different in reality.

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