



## Research Summary Sheet

### ***Deliverable n°: 1.1 (Task 1.5)***

***“Key indicators and methodologies for assessing the impacts on soil, water, air quality and human safety of agro-waste management”.***

**Direct impact through Waste conversion process**

**Source of harmful effect / Types of contaminants: Physical/Cold and Heat Stress**

#### **Impacts on human health**

Workers in waste management activities are subject to the hazards generally associated with performing physical labour near large equipment or in an outdoor environment including extreme heat and cold fatigue. Searl and Crawford (2012) explains when an individual's core temperature increases, the blood available has to both transport oxygen and transport heat from the body core. This results in a limitation on the level of oxygen available as temperature regulation appears to have priority over oxygen transport. Heat stress occurs when the body is subjected to temperatures that cause the core temperature to stay above 38°C, over the course of the workday. The heat stress can lead to related disorders such as fainting, prickly heat rash, heat exhaustion and heat stroke. The upper limit for optimal mental performance is 25°C .

The most likely situations where cold stress could happen are where employees are working outside in winter or in wet conditions. In cold working environment workers face the risk of hypothermia, even to the point of frostbite.

#### **Threshold levels**

Directive 89/391 describes the minimum safety and health requirements for the workplace. The temperature during working hours must be adequate for human beings, having regard to the working methods being used and the physical demands placed on the workers. Many countries took additional measures to raise the level of implementation and understanding or issued further regulations with higher level of details. (EC 2012)

Some national regulation, recommendation specifies only minimum temperature requirements, others gives upper limit for the work temperature for example in Spain it is 27°C for sedentary and 24°C for light work, while in Finland it is 25°C and 23°C accordingly. The 3/2002. (II. 8.) SZCSM–EüM Hungarian regulation describes in in closed environment reaches the 24°C corrected effective temperature (this is corrected value with humidity and airflow) the employer need to provide fluid replacement and 5-10 minutes breaks per hours.

Health and Safety Executive (HSE, UK) does not have specific guidance for working in temperatures below 13°C but suggests standards that provide a framework for protection of workers.



- BS 7915:1998, Ergonomics of the thermal environment. Guide to design and evaluation of working practices for cold indoor environments
- BS EN ISO 15743:2008, Ergonomics of the thermal environment. Cold workplaces. Risk assessment and management
- BS EN 511:1994, Specification for protective gloves against cold

The 4/2002. (II. 8.) SZCSM–EüM Hungarian regulation describes that a workplace is qualified as being « cold » if the temperature does not reaches 4°C for the 50% of the working hours in open air or 10°C for the 50% of the working hours in closed environment.

### **Control measures**

Different practices can help to reduce the effects of the heat stress or assist in acclimation, such as fluid replacement, providing accurate verbal and written instructions and training on heat stress, diet and life-style guidelines that can the risks of heat stroke.

The cold exposure can be decreased by wearing protective equipment such as appropriate clothing, mittens or gloves. Dehydration can occur in a cold environment and may increase the susceptibility of the worker to injury due to a change in blood flow to the extremities. Warm sweet drinks and soups should be consumed to provide caloric intake and fluids. Adequate planning of work (not too much standing or sitting in cold) is essential.

### **Bibliographic references**

Nellie J. Brown, M.S., (2016) Composting Safety and Health, Cornell Waste Management Institute

Alison Searl and Joanne Crawford (2012), Review of Health Risks for workers in the Waste and Recycling Industry, IOM, Date of report: 18th May 2012

Directive 89/391 /EEC concerning the minimum safety and health requirements for the workplace

3/2002. (II. 8.) SZCSM–EüM Hungarian regulation – Minimal requirements of workplaces.





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Source of harmful effect / Types of contaminants: Noise

#### **Impacts on human health**

Noise related hearing loss were identified as major issues for the operators in AD plants. The main source of high noise levels is the engine generator set. Decibel (dB) levels produced at an AD facility will differ due to varying acoustical settings, but a general set can produce between 100 – 140 dB. (Agstar, 2011).

Exposure to high levels of noise can result in discomfort or short-term hearing loss. In extreme cases, or if the noise exposure occurs over a long period of time, permanent hearing loss can occur (Directive 2003/10/EC).

#### **Threshold levels**

Noise exposure limits values are defined in Directive 2003/10/EC. Besides the exposure limit values it defines the action values, which are once exceeded, the employer must implement an action plan to prevent exposure from exceeding the exposure limit values.

The daily noise exposure limit value is 87 dB for a nominal eight-hour working day. The peak sound pressure (maximum value of the "C"-frequency weighted instantaneous noise pressure) is 200 Pa. The upper exposure action values are 85 dB (for eight hour) and 140 Pa peak sound pressure respectively.

In Agstar Guidleline (2011), which is specific for anaerobic digestions, shows the safe allowable decibel levels are indicated for noise. These were established by OSHA and measured with a sound level meter set on slow response. The safe maximum allowable decibel level is defined as 90 dB for 8 h but if the noise level increases the safe maximum allowable level decreases e.g. 90dB for 8h, 95 B for 4h, 105dB for 1h.

#### **Control measures**

Use of personal protective equipment is advised to reduce exposure to noise.





### Bibliographic references

Directive 2003/10/EC of the European Parliament and of the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise)

Agstar, Common safety practices for on farm anaerobic digestion, December 2011





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Source of harmful effect / Types of contaminants: Vibration

#### **Impacts on human health**

Hand arm vibration were identified as one of the major issues for the operators in AD plants. Using vibrating tools, handling vibrating machine controls, or sitting on vibrating equipment can cause exposure. (e.g.. grinding, employing engines, abrasive actions. etc.)

Vibration is the oscillation of a body about a reference point. The number of oscillations per second gives the frequency of vibration (Hz). Vibration can be felt as it is transmitted through solid structures directly to the human body. Prolonged vibration can produce damage to tiny nerves and blood vessels.

#### **Threshold levels**

Directive 2002/44/EC describes the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents. Besides the exposure limit values it defines the action values, which are once exceeded, the employer must implement an action plan to prevent exposure from exceeding the exposure limit values. Measurement of hand-arm vibration is also described in Directive 2002/44/EC.

For hand-arm vibration the daily exposure limit value standardised to an eight-hour reference period is 5  $m/s^2$ ; while the daily exposure action value standardised to an eight-hour reference period is 2,5  $m/s^2$ . For whole-body vibration the daily exposure limit value standardised to an eight-hour reference period is 1,15  $m/s^2$ , while the daily exposure action value standardised to an eight-hour reference period is 0,5  $m/s^2$ .

#### **Control measures**

Padded or gel-filled gloves for vibrating tools or machine controls; good seat cushions and proper seat shape to protect the lower back can reduce the exposure to vibration. Plan must be prepared for breaks and recovery/rest periods.





### **Bibliographic references**

Nellie J. Brown, M.S., (2016) Composting Safety and Health, Cornell Waste Management Institute

Directive 2002/44/EC – on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration)

