Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Meat and Poultry Products Industry Point Source Category (40 CFR 432)

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Complete proposed document available at:
http://www.epa.gov/ost/guide/mpp/
The Final Development Document is available as well.

SECTION 10

NON-WATER QUALITY ENVIRONMENTAL IMPACTS

Sections 304(b) and 306(b) of the Clean Water Act require EPA to consider non-water quality environmental impacts (including energy requirements) associated with effluent limitations guidelines and standards. To comply with these requirements, EPA considered the potential impact of the proposed meat and poultry products (MPP) rule on energy consumption, air emissions, and solid waste generation. A discussion of the proposed technology options is given in Section 9 of this Development Document. Considering energy use and environmental impacts across all media, the Agency has determined that the impacts identified in this section are justified by the benefits associated with compliance with the proposed limitations and standards. Section 10.1 discusses the energy requirements for implementing wastewater treatment technologies at MPP facilities. Section 10.2 presents the impact of the proposed technologies on air emissions, and section 10.3 discusses the impact on wastewater treatment sludge generation.

10.1 ENERGY REQUIREMENTS

EPA estimates that compliance with this rule will result in a small net decrease in energy consumption at non-small MPP facilities that are direct dischargers, and no change in energy consumption at all MPP facilities that are indirect dischargers (as EPA is proposing no PSES and PSNS for all MPP subcategories). EPA did, however, estimate the energy consumption at non-small MPP facilities that are indirect dischargers and noted a small net increase in energy consumption. Table 10-1 and 10-2 present estimates of energy usage by technology option for both non-small direct and indirect dischargers, respectively. For the selected proposal technology options which apply to non-small direct discharging facilities only, EPA estimates that there will be a reduction in total annual energy use (a net reduction of 144 million KWH/yr). This is a relatively small net reduction compared to the total annual amount of energy purchased by non-small direct discharging facilities (2,929 million KWH/yr). There are no incremental energy impacts for direct dischargers that are small poultry slaughterers (Subpart K) or small

Table 10-1. Incremental Energy Use for Existing Non-Small MPP Facilities, Direct Dischargers[a]

40 CFR 432 Subcategory Groupings[b]	Total Energy Purchased per Non-Small MPP Facility million KWH/fac.-yr	Incremental MPP WWTP Energy Use per Non-Small MPP Facility in units of million KWH/fac.-yr and Total Energy Usage Percent Increase per Non-Small MPP Facility [% Increase]			
		BAT-2	**BAT-3**	**BAT-4**	**BAT-5**
A, B, C, D	11.42	0.0221 [0.19%]	-0.9324 [-8.89%]	-1.0759 [-10.40%]	NA
F, G, H, I	13.46	0.0017 [0.01%]	-0.0239 [-0.18%]	-0.0354 [-02.26%]	NA
J	5.47	0 [0.00%]	-0.2415 [-4.62%]	-0.261 [-5.01%]	NA
K	13.53	0.0031 [0.02%]	-0.627 [-4.86%]	-0.6076 [-4.70%]	-0.6033 [-4.67%]
L	13.46	0.0021 [0.02%]	-0.1088 [-0.81%]	-0.1094 [-0.82%]	-0.1519 [-1.14%]

[a] "Non-small" facilities include Medium, Large, and Very Large Facilities. (See Section 11.3 for a description of these facility classifications.)

[b] Small Processors (Subpart E) are not covered under the proposal, and do not have any net incremental NWQIs (including energy usage.)

Table 10-2. Incremental Energy Use for Existing Non-Small MPP Facilities, Indirect Dischargers[a]

40 CFR 432 Subcategory Groupings[b]	Total Energy Purchased per Non-Small MPP Facility million KWH/fac.-yr	Incremental MPP WWTP Energy Use per Non-Small MPP Facility in units of million KWH/fac.-yr and Total Energy Usage Percent Increase per Non-Small MPP Facility [% Increase]			
		PSES-1	**PSES-2**	**PSES-3**	**PSES-4**
A, B, C, D	11.42	0.2644 [2.26%]	4.5467 [28.48%]	2.0473 [15.20%]	1.6061 [12.33%]
F, G, H, I	13.46	0.1227 [0.90%]	0.6021 [4.28%]	0.3404 [2.47%]	0.3137 [2.28%]
J	5.47	0.0243 [0.44%]	0.4617 [7.78%]	0.0061 [0.11%]	-0.0547 [-1.01%]
K	13.53	0.1423 [1.04%]	2.6724 [16.49%]	0.9385 [6.49%]	0.8078 [5.63%]
L	13.46	0.0995 [0.73%]	0.6519 [4.62%]	0.3194 [2.32%]	0.2933 [2.13%]

[a] "Non-small" facilities include Medium, Large, and Very Large Facilities. (See Section 11.3 for a description of these facility classifications.)

[b] Small Processors (Subpart E) are not covered under the proposal, and do not have any net incremental NWQIs (including energy usage.)

poultry further processors (Subpart L) because all of these small facilities are currently implementing the proposed limitations and standards (See Section 6.3.1 of Administrative Record - EPA 2001 Screener Survey). EPA is proposing no PSES and PSNS for all indirect dischargers in all MPP subcategories. EPA did, however, estimate the energy usage at non-small MPP facilities that are indirect dischargers and noted a small net increase in energy usage in most cases.

In estimating energy use associated with BAT-3, BAT-4, and BAT-5, it was assumed that anaerobic lagoon effluent would be used as the source of organic carbon necessary for denitrification. This approach reduces oxygen transfer requirements and associated electrical energy use for BOD reduction aerobically subsequent to anaerobic treatment. It has been demonstrated that the electrical energy required for complete nitrification can be reduced by approximately 20 percent through anoxic wastewater BOD reduction realized during denitrification (Randall et. al., 1999). BAT-4 provides a small additional reduction in electrical energy use as compared to BAT-3, given the BOD reduction occurring the anaerobic phosphorus release phase of phosphorus removal.

EPA used facility count, wastewater flow, and treatment-in-place data from the MPP screener survey and detailed survey to develop the energy use estimates presented in Tables 10-1 and 10-2. EPA also used data from the 1997 U.S. Census of Manufacturers to estimate energy demand for MPP facilities. See Appendix D for a listing of input values used to estimate energy usage.

10.2 AIR EMISSIONS IMPACTS

The Agency believes that wastewater treatment processes included in the technology options for this rule will not generate significant incremental air emissions, either directly from the facility or indirectly through increased air emissions impact from the electric power generation facilities providing the additional energy.

Odors are the only significant air pollution problem associated with the treatment of MPP wastewaters and generally are associated with anaerobic conditions. Thus, flow equalization basins, dissolved air flotation (DAF) units, and anaerobic lagoons are potential sources of malodors. However, odor problems usually are significant only when the sulfur content of MPP wastewaters is high especially when treatment facilities are well managed. Generally, MPP wastewater treatment facilities using anaerobic processes for treating wastewater with a low sulfur concentration have few odor problems (USEPA, 1974). At such facilities, maintaining a naturally occurring layer of floating solids in anaerobic contact basins and lagoons generally minimizes odors. Thus, the proposed technology options should not increase emissions of odorous compounds from well-managed MPP wastewater treatment facilities. EPA visited several MPP facilities that EPA considered to be operating the selected proposal technology options. None of these BAT facilities had odor control problems.

The requirement of nitrification for BAT-2 through BAT-5 should reduce ammonia emissions by reducing air stripping of ammonia during aerobic treatment. However, the requirement of anaerobic treatment for initial BOD reduction before aerobic treatment will increase methane and VOC emissions, but increases should be negligible given the current extensive use of lagoons and other anaerobic processes in MPP wastewater treatment. In addition, covering anaerobic lagoons and flaring the biogas captured can reduce these emissions. If the volume of biogas captured is sufficient, its use as a fuel to produce process heat or electricity, or both, is an option. EPA observed two MPP facilities capturing biogas for use as an alternative fuel during its 2001 site visits.

As previously stated, EPA estimates an annual net energy reduction of 144 million KWH for the selected proposal technology options which applies to non-small direct discharging facilities only. This annual net energy reduction, however, is small compared with the amount of energy used by MPP direct dischargers (2,929 million KWH/yr) and trivial when compared with the total electricity used by the entire United States in 1999 (3,501 billion KWH) (See the Energy Information Administration - http://www.eia.doe.gov/emeu/aer/txt/tab0812.htm).

10.3 SOLID WASTE GENERATION

The most significant non-water quality impact (NWQI) of the proposed technology options for this rule is the generation of additional solid wastes from MPP wastewater treatment.

One source of these additional solids generation is wastewater screening to remove larger suspended solids, such as pieces of soft and hard tissue, including feathers and hair as the initial treatment unit process. These solids are non-hazardous, have value as raw materials for by-product production by rendering, and are not considered to be soild waste. Accordingly, generation of this solids is not considered to have NWQIs. A second source of solids in MPP wastewaters treatment is DAF units used to remove a substantial fraction of the suspended solids in MPP wastewaters remaining after screening. At some MPP facilities, this material, commonly known as DAF float, is disposed of by rendering and has economic value. However, DAF float also is considered as a waste at some facilities and is disposed of by land filling or land application. The utilization of DAF float in the production of rendered products or disposal as a waste depends on the types of rendered product being produced. EPA noted during site visits to two independent rendering operations that sludges from dissolved air floatation units which use chemical additions to promote solids separation are rendered; however, the chemical bond between the organic matter and the polymers requires that the sludges be processed (rendered) at higher temperatures (260 ºF) and longer retention times (see Section 6.1.2.2 of Administrative Record - Renderer #1 CBI Site Visit Report). Because both direct and indirect dischargers currently use USC DAF extensively in MPP wastewater treatment, EPA feels that the proposed rule will have no significant impact on DAF float generation.

Additional sources of solids generated in the treatment of MPP wastewaters are the physiochemical and biological treatment processes used following DAF. These solids consist of a mixture of those suspended solids not initially removed by screening and DAF, and the microbial mass generated during biological treatment processes. These solids are collectively known as sludge and typically have a moisture content of between 95 and 98 percent before thickening. Generally, MPP wastewater sludges are thickened, stabilized, stored in holding ponds or anaerobic lagoons, and/or dried before ultimate disposal typically by land application. A wastewater treatment plant operator for a poultry slaughtering facility, which utilizes BAT-5 technology, noted that sludges from his facility are used as a soil amendment via subsurface injection for crops raised on the facility's property. Other options for the ultimate disposal of

MPP wastewater sludge are land filling and incineration, which require a substantial reduction in moisture content as a prerequisite.

EPA estimates that compliance with this proposed rule generally will slightly decrease the generation of sludges during MPP wastewater treatment. For the selected proposal technology options which apply to non-small direct discharging facilities only, EPA estimates that there will be a 3.4 percent reduction in total annual sludge production (a net reduction of approximately 16,500 tons/yr). This is a relatively small net reduction in comparison with the current total annual amount of sludge production by non-small direct facilities (approximately 500,000 tons/yr). Tables 10-3 and 10-4 present the amount of wastewater treatment sludge expected to diminish at non-small facilities as a result of implementing each of the technology options. It is assumed that the sludge generated contain 50 percent moisture after being dried in a sludge dryer. EPA used facility count, wastewater flow, and treatment-in-place data from the MPP screener survey and detailed survey to develop these sludge generation estimates. See Appendix D for a listing of input values used to estimate sludge generation. There are no incremental sludge generation impacts for direct dischargers that are small poultry slaughterers (Subpart K) or small poultry further processors (Subpart L), because all of these small facilities are currently implementing the proposed limitations and standards (Section 6.3.1 of Administrative Record—EPA 2001 Screener Survey). EPA also is proposing no PSES and PSNS for all indirect dischargers in all MPP subcategories. EPA did, however, estimate the sludge generation at non-small MPP facilities that are indirect dischargers and noted a nominal to substantial increase in sludge generation (Table 10-4).

As shown in Table 10-3, BAT-3 for direct dischargers results in a small net decrease in sludge generation when compared to the estimate of sludge generation for BAT-2. The estimates of sludge production for BAT-3 also are based on the assumption that anaerobic lagoon effluent will be the source of organic carbon necessary for denitrification. The use of organic carbon in anaerobic lagoon effluent for denitrification will reduce BOD and the sludge production during subsequent aerobic treatment to satisfy BOD reduction requirements for direct discharge. Although microbial mass is synthesized during denitrification, which requires anoxic conditions,

Table 10-3. Incremental Sludge Generation for Existing Non-Small MPP Facilities, Direct Dischargers[a]

40 CFR 432 Subcategory Groupings[b]	Baseline Total Sludge Generated at Non-Small MPP Facilities, Direct Dischargers (tons/year)	Incremental Sludge Generated - tons/yr and Percent Increase [% Increase] For Non-Small MPP Facilities, Direct Dischargers			
		BAT-2	BAT-3	BAT-4	BAT-5
A, B, C, D	353,794	0 [0.0%]	-5,976 [-1.7%]	-5,334 [-1.5%]	NA
F, G, H, I	6,564	0 [0.0%]	-45 [-0.7%]	-26 [-0.4%]	NA
J	3,655	0 [0.0%]	-124 [-3.4%]	-124 [-3.4%]	NA
K	129,917	0 [0.0%]	-10,353 [-8.0%]	8,533 [6.6%]	8,533 [6.6%]
L	3,326	0 [0.0%]	-146 [-4.4%]	-137 [-4.1%]	-909 [-27.3%]

[a] "Non-small" facilities include Medium, Large, and Very Large Facilities. (See Section 11.3 for a description of these facility classifications.)

[b] Small Processors (Subpart E) are not covered under the proposal, and do not have any net incremental NWQIs (including sludge generation.)

Table 10-4. Incremental Sludge Generation for Existing Non-Small MPP Facilities, Indirect Dischargers[a]

40 CFR 432 Subcategory Groupings[b]	Baseline Total Sludge Generated at Non-Small MPP Facilities, Indirect Dischargers (tons/year)	Incremental Sludge Generated - tons/yr and Percent Increase [% Increase] For Non-Small MPP Facilities, Indirect Dischargers			
		PSES-1	PSES-2	PSES-3	PSES-4
A, B, C, D	63,466	0 [0.0%]	227,567 [358.6%]	187,011 [294.7%]	189,695 [298.9%]
F, G, H, I	2,599	302 [11.6%]	58,071 [2234.6%]	48,598 [1870.1%]	50,046 [1925.8%]
J	9,520	32 [0.3%]	11,259 [118.3%]	9,212 [96.8%]	9,522 [100.0%]
K	38,422	97 [0.3%]	188,012 [489.3%]	162,621 [423.3%]	162,589 [423.2%]
L	2,360	228 [9.6%]	61,213 [2593.6%]	53,794 [2279.2%]	54,233 [2297.8%]

[a] "Non-small" facilities include Medium, Large, and Very Large Facilities. (See Section 11.3 for a description of these facility classifications.)

[b] Small Processors (Subpart E) are not covered under the proposal, and do not have any net incremental NWQIs (including sludge generation.)

the rate of net cell synthesis is lower than that under aerobic conditions. This reduction in sludge production with BAT-3 due to the reduction of BOD under anoxic conditions more than offsets the increased sludge production associated with complete nitrification (BAT-2), because of the very low growth rate of the microorganisms responsible for nitrification. Full-scale domestic wastewater treatment plants have shown a five to 15 percent reduction in waste sludge production after the inclusion of the nitrification/denitrification process (Randall, et. al, 1999). Implementation of BAT-4 and BAT-5 would further decrease sludge generation.

EPA also expects that more emphasis on pollution prevention by increased segregation of waste materials that have value as raw materials for the production of rendered products from wastewater flows could further reduce sludge generation. Examples of such pollution prevention practices include using alternatives of fluming to remove viscera from processing areas and initially "dry cleaning" facilities as the initial step in the daily cleaning of processing equipment and facilities. If contact with water is prevented, fats and proteins that become dissolved and are not captured subsequently by screening and DAF do not become sources of BOD and ammonia nitrogen. Such pollution prevention practices also have the potential to reduce overall water use in MPP processing.

10.4 REFERENCES

Randall W., Z. Kisoglu, D. Sen, P. Mitta, and U. Erdal. 1999. Evaluation of Wastewater Treatment Plants for BNR Retrofits Using Advances in Technology, Virginia Polytechnical Institute and State University, Department of Civil and Environmental Engineering, Blacksburg, Virginia: Submitted to the USEPA Chesapeake Bay Program, Annapolis, Maryland. (DCN 00031)

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