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REDUCING WASTE LOADS FROM POULTRY PROCESSING PLANTS

Large quantities of water are used by the poultry processing industry. Water is used to ease mechanical feather removal, to transport feathers and viscera after removal, to wash and chill the carcass, to make ice and for plant cleanup.

A major use of the water in poultry plants is to transport feathers and offal from the processing area. For this reason, the wastewater is always high in organic waste. Most poultry plants recycle the feather and offal screenings into feed ingredients which are then fed to birds being raised by the same company. A few companies sell the offal to the manufacturers of dog food. Therefore, the processing plant manager is interested in removing as great a quantity of organic material from the water as possible before the wastewater is discharged. Additionally, organic materials discharged with the plant effluent can result in an extra expense for water treatment by the plant or as a surcharge by the municipality for this treatment.

The extensive use of water in poultry plants has developed from industry efforts to reduce bacterial load and produce a qaulity bird. In addition, labor requirements tend to be lower with higher water use. However, with the increased costs involved in water purchase and wastewater cleanup and disposal, a new look is being given water use in poultry plants. As water use is reduced, pollutant concentration in wastewater goes up.

Basically, the problem of disposing of pollutant load can be approached from two directions. The first of these involves the post-processing cleanup of plant wastewater so that it can be discharged into a municipal sewage system or directly into streams. This area is generally considered when sanitary engineers talk about pre-treatment facilities in poultry plants — work to cleanup the effluent at the "end of the pipe" just before discharge. The second involves in-plant facility, equipment, or flow alterations designed to keep organics out of the wastewater — or to decrease their concentration before entering the general plant effluent.

An earlier study in the demonstration plant indicated that pumping the feather and offal transport waters up from a floor sump onto rotary screens had increased the wastewater problem. The first series of samples of the present study were taken to ascertain this suggested pumping effect. Analysis of these samples showed that the pumping of the unscreened feathers and especially the unscreened offal was breaking up the pieces so that the rotary screens used could not do their job efficiently. (table 1).

The plant made some alterations and screened both the feather water and the offal water prior to any pumping. This involved moving the screens into pits below floor level and augering the organic wastes from the end of the screen. The screened water was then pumped to another screen and on to a small settling pit before discharge to the city.

Immediately after making this screen placement change, the plant was sampled for regular surcharge billing. In the previous sample period, BOD had been 880 mg/dm^3 and TSS had been 1050 mg./dm^3. After moving the screens, a sample revealed a BOD of 680 mg/dm^3 and TSS of 270 mg/dm^3. These decreases resulted in a monthly surcharge saving of approximately $ 3,500.00.

In addition, the change in effluent quality was noted by the city. It was reported that the city sewage treatment plant personnel noticed the change, visually, immediately after the plant made their change

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in screening procedure. Also, the city was reported to be meeting EPA standards for discharge for the first time.

Most poultry plants can improve their situation greatly by a common sense look at their plant from the inside. There are many areas in which plant management may be able to reduce organic load through work habits or routine — without large capital expenditures. Each plant and its situation will be different but some areas that deserve consideration in any plant are:

1. Dry cleanup of areas where organics accumulate — as pinning room and neck skin trims.
2. Dry cleanup prior to washdown.
3. Dry handling of large pieces.
   a. Heads,
   b. Feet,
   c. Viscera,
   d. Oil sacs (preen glands),
   e. Feathers.
4. Proper dry handling of blood and materials from lung guns.

Additionally, there are in most plants several areas of low volume wastewater with high organic load which could be treated separately before being added to the total plant wastewater. For example, chiller water overflow (especially neck chiller water) is exceptionally high in fat. Equipment needed to remove a large percentage of this fat from the cold, low volume flow before it enters the main plant flow is far less expensive than that needed to treat the entire plant flow.

Hydra-screening or static screen use for removal of effluent loads is a relatively new process that offers great potential for use in selected areas of processing. The hydra-screen is a small unit, is relatively inexpensive and has no moving parts. In principle, the water is separated from the solids by using the surface tension differential existing between the screen, the water and the effluent contaminant. The water is physically separated from the contaminant by a specially designed non-moving "static screen". Our research

Table 1

Poultry plant effluent

Sample	BOD_5 mg/dm³	TSS mg/dm³	Grease mg/dm³
Final plant	855	675	520
Feather water pre-pump	295	325	110
Feater water post-pump	370	370	125
Process water pre-pump	**370**	**320**	425
Process water post-pump	**645**	**1030**	535
Scald water	555	510	750
Neck chill	1250	1990	1225

in this area has indicated that the static screen offers its greatest potential for removal of effluent contaminants when used in those areas of processing which are low volume — high loading systems. We have evaluated the separation efficiency of the hydra-screen in removing effluent loading at several locations within the processing plant. Separation efficiency data is indicated in table II.

Generally, we have found the screen to be very effective in removing non-dissolved materials. Dissolved materials, such as blood, and materials which are suspended as very small particles are not effectively removed by the screen. Tissue particles, bone fragments and grease are generally present in a non-dissolved form and in size particles which can be easily removed by the screen. This data indicates a potential beneficial use of the hydra-screen separation system in low volume, high pollutant loading areas of processing such as effluents from giblet chill, neck chill and carcass chill tanks.

Table 2

Percent reduction of effluent loading by hydra-screen*

Effluent system	BOD_5	COD	Residue			TSS	
			Total	Fixed	Volatile		
Giblet chill	31.5	53.3	22.1	16.8	25.4	37.8	59.4
Neck chill	20.1	22.8	37.5	0.1	42.6	42.0	74.8
Carcass chill	38.7	57.6	16.2	0.0	37.5	54.8	58.3
Scald	11.8	37.8	4.3	6.6	2.4	6.3	9.3
Final plant	7.6	0.7	11.4	5.0	14.3	9.6	84.5

* Percent effluent load reduction.

For many poultry plants there are two ways to reduce effluent load — in the plant and outside the plant. This report is concerned with the area in which food technologists feel most familiar — inside the plant. Through plant surveys and some equipment and routine changes, reductions have been achieved. There is room for more reduction in most plants before, or in addition to, considering more sophisticated wastewater pre-treatment facilities.

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