FATS AND PROTEINS RESEARCH FOUNDATION, INC.

Director's Digest

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## Des Moines Revisited--Odor Control in the Rendering Industry

Continued studies at National By-Products, Inc. of Des Moines, Iowa have aided in the design of wet scrubber systems for rendering plant odor control. The work is being conducted by IIT Research Institute under contract with the Fats and Proteins Research Foundation and with the support of the Environmental Protection Agency.

Experiments to determine the most effective and economical combination of scrubbing liquids were performed on a laboratory packed-bed scrubber using high odor intensity process air normally vented to an incinerator. These results are summarized in Table I. Each combination includes three stages. The results are similar to those obtained earlier on a plant-scale horizontal scrubber. Thus combinations A and D were less effective than B, C and E, all of which gave 98 to 99.9% odor removal.

In order to obtain a direct comparison of the scrubbing reagents the laboratory scrubber was modified to operate the last two stages in parallel rather than in series. Thus in a comparison of combinations B and C, gas chromatographic analysis of some sixteen different odorous components indicate the two to be equally effective. In addition, two stages of 1% sodium hypochlorite were found to be more effective than one of 1% sodium hypochlorite followed by a stage of 1% caustic.

Using the very effective hypochlorite solution in all three stages, a two week evaluation of the plant-scale horizontal spray scrubber was performed. Instead of operating on a batch basis, a continuous blow-down, make-up system was used. Thus, reagents were metered into the third stage, the solution permitted to overflow in a countercurrent redistribution to the second and first stages. Overflow (blow-down) from the first stage was sewered. Chlorine and caustic (hypochlorite generation) were introduced intermittently into the last stage and active chlorine and pH monitored

periodically. The effectiveness of odor reduction was directly proportional to the alkalinity of the hypochlorite. Plant ventilating air entering the scrubber contained odor levels of 165 to 2500 odor units. Scrubbing successfully reduced odor levels to the 20 to 135 odor unit level. Average removal of each odorous component was 85% according to gas chromatography and odor level reduction averaged 92%. This system operated over 175 hours with no deterioration in performance.

These studies further show that spray scrubbers are most effective for removing odorous components from plant ventilating air (odor levels less than 2,000 odor units). For high intensity gas streams where a large reduction in odor level is sought, packed towers are recommended. Although design and costs calculations indicate that packed towers cost about twice as much to install as horizontal scrubbers, their continuous chemical and operating costs are about the same.

Scrubbing of concentrated odor streams can result in substantial savings as compared to incineration. For example, a three stage, 10,000 cfm scrubber treating the cooker off-gas would use $26,300 of chemicals/year compared to an incinerator which would use $64,000 of natural gas (at $1.00/1,000 scf) each year.

Part of the study was devoted to an examination of on-site generation of hypochlorite. This economic alternative is achieved by electrolysis of brine. It can prove feasible where shortages of chlorine gas exist, safety standards are forcing plants to discontinue chlorine gas usage or the gas itself is too costly. The capital investment in on-site generation equipment is appreciable however, and only larger installations may find it attractive.

Further details and data are contained in the report entitled "Odor Control by Scrubbing in the Rendering Industry". Copies are available on request from the Fats and Proteins Research Foundation office.

TABLE I

LABORATORY SCRUBBER COMPARATIVE SCRUBBING TESTS

| Combination | Test No. | Inlet $ED_{50}$ | Outlet $ED_{50}$ | Odor Panel % removal | GC % removal |
|---|---|---|---|---|---|
| A | | | | | |
| Caustic | 2 | 330 | 120 | 64 | - |
| Caustic | 3 | 65 | 30 | 54 | - |
| Chlorine | | | | | |
| B | | | | | |
| Caustic | 5 | 15 | 10 | 33 | - |
| Hypochlorite | 7 | 17,000 | 45 | 99.7 | - |
| Peroxide | 10 | 34,000 | 460 | 98.6 | 98 |
| C | | | | | |
| Hypochlorite | 11 | 63,000 | 550 | 99.1 | - |
| Hypochlorite | 25 | 8,300 | 20 | 99.8 | - |
| Hypochlorite | 26 | - | - | - | 96 |
| D | | | | | |
| Caustic | 12 | 190 | 150 | 21 | - |
| Hypochlorite | 21 | - | - | - | 81 |
| Hypochlorite | | | | | |
| E | | | | | |
| Hypochlorite | 23 | 11,500 | 20 | 99.8 | 97 |
| Hypochlorite | 24 | 12,500 | 10 | 99.9 | 94 |
| Caustic | | | | | |

$ED_{50}$ = number of dilutions at which 50% of the panelists begin to detect odor.