

WALK THROUGH SURVEY REPORT  
OF THE  
PESTICIDE/HERBICIDE BAGGING OPERATION  
AT  
MONSANTO AGRICULTURAL PRODUCTS COMPANY,  
AN OPERATING UNIT OF MONSANTO COMPANY  
AT MUSCATINE, IOWA.

SURVEY DATE  
JUNE 24, 1981

Survey Conducted By  
Charleston C. K. Wang  
Stephanie Spottswood

Survey Report Written By  
Charleston C. K. Wang

Date of Report  
July 15, 1981.

Engineering Control Technology Branch  
Division of Physical Sciences and Engineering  
National Institute for Occupational Safety and Health  
Cincinnati, Ohio.

PLACE VISITED: Monsanto Agricultural Products Company.  
P.O. Box 473  
Muscatine Iowa  
Phone: (319) 263-0093.

DATE OF VISIT: June 24, 1981.

PERSONS MAKING VISIT: Charleston C. K. Wang  
Stephanie Spottswood

DATE OF REPORT: July 15, 1981.

NAMES AND OFFICIAL TITLES OF PERSONS CONTACTED: Mr. Roger Swanson, Industrial Hygienist  
Mr. Robert Fields, Plant Manager  
Mr. Lawrence Mauerman, Safety Supervisor  
Mr. Donald Evans, Environment Control Superintendent  
Mr. Dave Sheridan, Sr. Industrial Hygiene Technician

UNION: None contacted.

PURPOSE: To conduct a preliminary survey of the bagging operation to determine its suitability for an in-depth survey for the Dry Chemical Bagging and Filling Operations Project.

WEATHER CONDITIONS DURING VISIT: Temperature 80-85°F  
Humidity high.

## SUMMARY

The bagging operation at the Monsanto Agricultural Products plant in Muscatine has features that merit an in-depth study. The operation is a good example of engineered equipment and other occupational safety and health programs for the bagging of granular (24-50 mesh) pesticides/herbicides into 50-lb. bags. Given an in-depth study, some of the control technology found here may be successfully adapted to control similar dust problems elsewhere.

Monsanto appears receptive to an in-depth study of their bagging operations.

## INTRODUCTION

NIOSH works cooperatively with firms in many industries to identify and more importantly, to solve problems in occupational health. The Engineering Control Technology Branch of the Division of Physical Sciences and Engineering, NIOSH, is conducting a research study to assess and document the exemplary technology available for the control of airborne dust in dry chemical/solid material bagging, conveying and filling operations. The control technology studied will be described in sufficient detail to allow the information to be used to prevent or reduce the generation and transmission of dust and the exposure of workers to toxic or hazardous substances in industrial operations elsewhere. The end product will be resource documents/articles containing practical ideas on control methods. Such documents will enhance the design engineer's understanding of industrial hygiene principles and also enable the industrial hygienist to participate more effectively in the design and improvement of control equipment. The results of the assessment will be disseminated in a manner that will maximize the application of demonstrated control technologies in the workplace. The study will have a positive impact on worker health by pin-pointing and stimulating the across-the-board use of good control methods as solutions to occupational health problems.

## PLANT DESCRIPTION

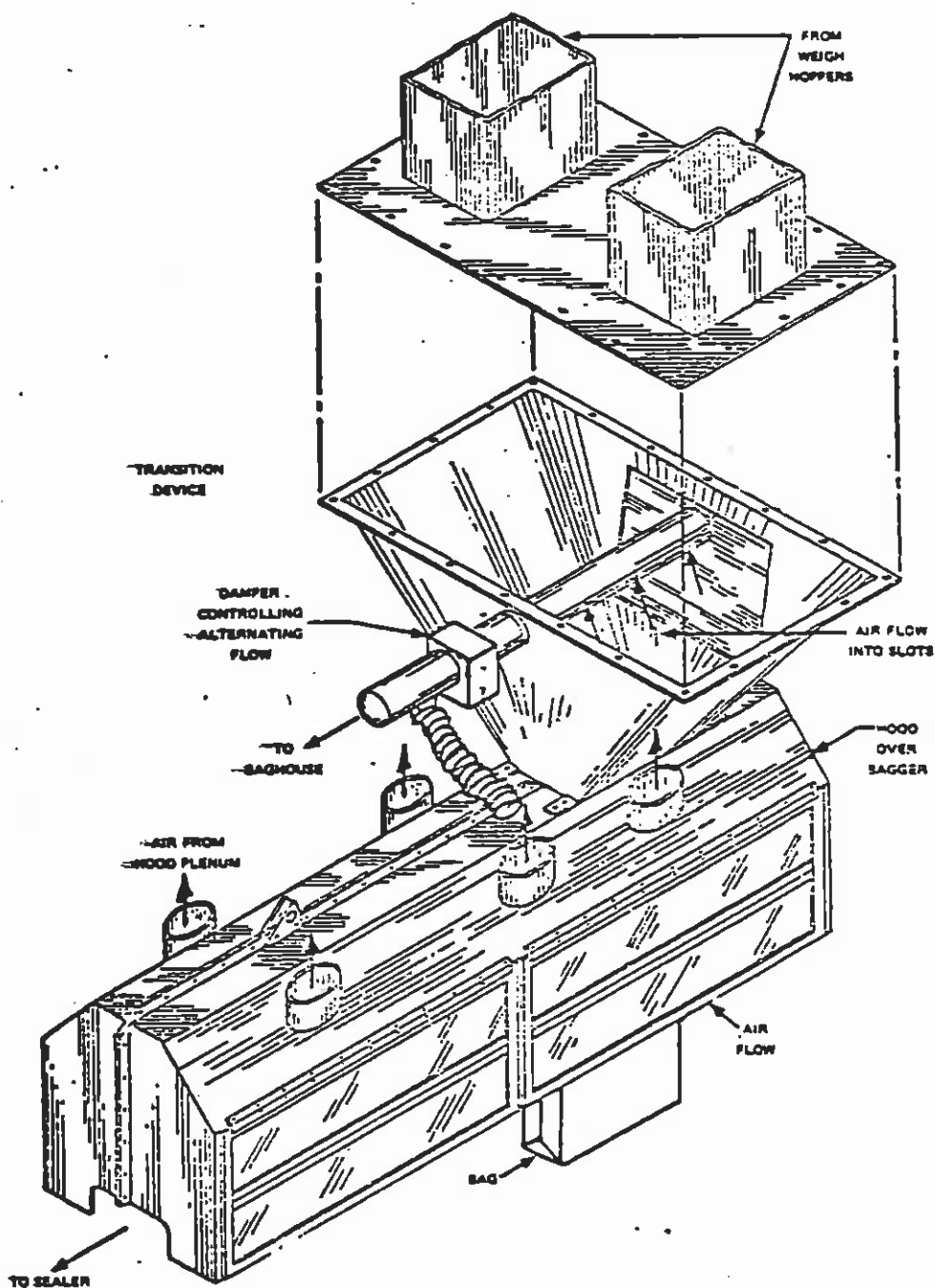
The plant is located in a rural area where summers are hot with varying humidity and winters are cold with 50-60 inches of snowfall. The plant produces a variety of plastics/polymers and agricultural products. Because of the variance in climate, product manufacturing is scheduled partly on the basis of climate. Agricultural products formulated include Lasso\*, Ramrod\*, Avadex\* (all three are herbicides that are sold in granular and liquid form) and Machete\* (a liquid herbicide) (\* all four names are Registered Trademarks of Monsanto Company). Some materials are shipped in and formulated on-site. The plant has operated since 1962. The entire facility has 450-500+ employees with 150-180 being administrative support and salaried supervisors.

PROCESS DESCRIPTION

The granular formulation building has three stories. The warehouse is separate.

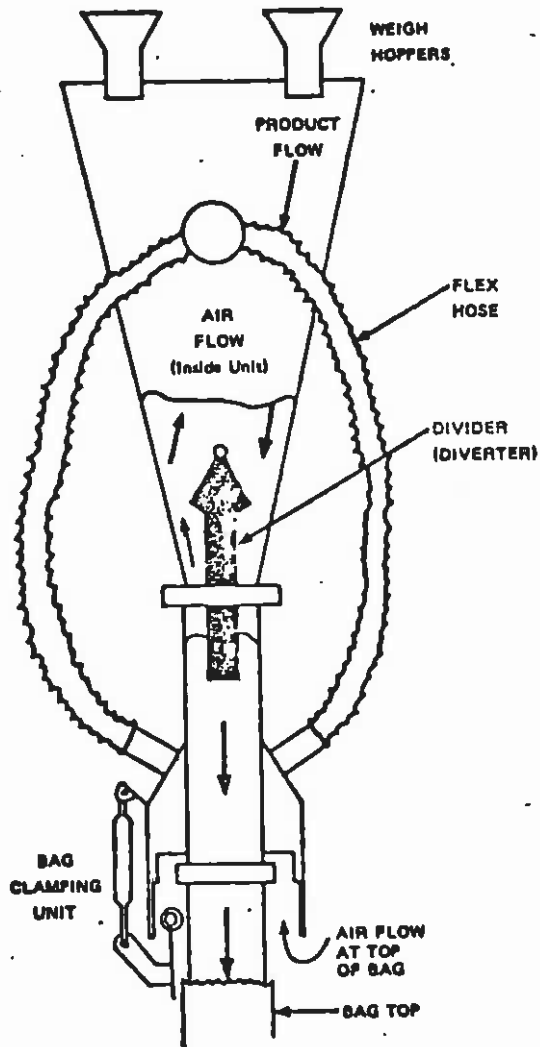
The bagging operation is operated on a three shift basis involving 30-40 technicians working rotating shifts. The bagging machinery was installed in 1979. It is a 1978 commercial unit, (Model 207) manufactured by Ouachita Machine Works of 120 North Hilton, West Monroe, Louisiana under license from Olinkraft Corporation. Figure 1 gives a drawing of the overall unit.

Figure 1 - Hooded Bagging Machine



A brief description of the working of the system is as follows. Formulation material is moved by a bucket elevator into a mixer, through a screen, up another bucket elevator into weigh hoppers prior to filling into bags. There are silos for material storage. During filling and bagging, the formulated product from weigh hoppers is dropped through a transition unit containing a divider which permits the product to flow down one side while air flows up the other side. Figure 2 gives a schematic while figure 6 gives an external view of this transition unit.

Figure 2 -- Schematic of Transition Unit and Bag Clamp



The slotted pipe (see figure 3) is coupled to a collection system at the mouth of the bag (see figure 2 and 3).

Figure 3 - External View of Transition Unit

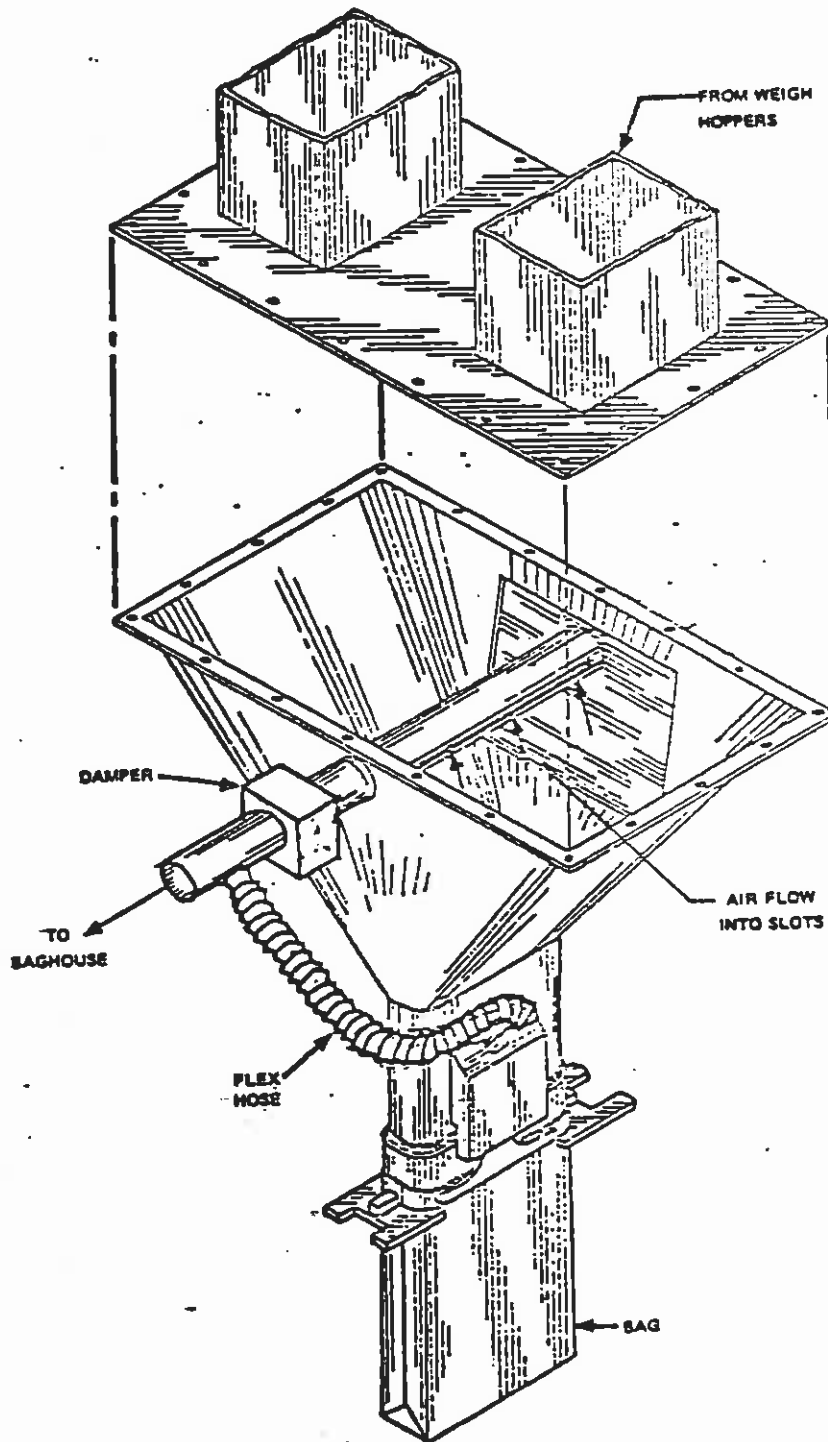
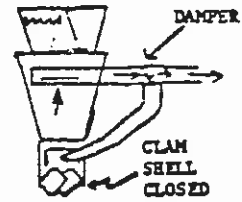
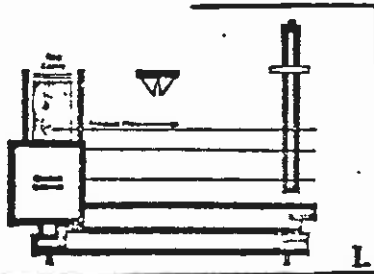


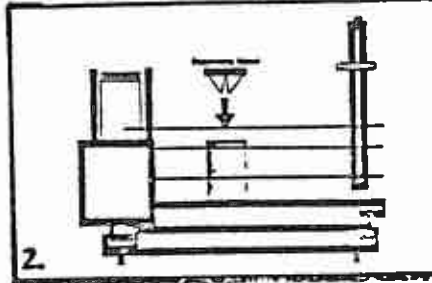
Figure 4 gives the sequence of the filling operation.

Figure 4 - The Filling and Bagging Sequence

1. Suction cups take bag from caddy moving in into position toward filler spout, opening bag annouce.

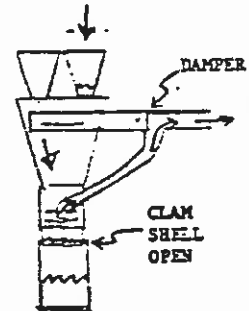
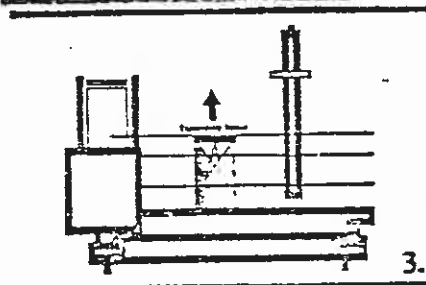


2. Positioned bag receives charge from clam-shell styled spout designed to fit exact mouth circumference of bag. On Model 207, fill spout is lowered to bag; on Model 206, bag is moved upward to spout and bag hanger.

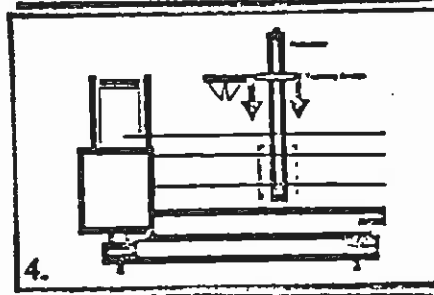


1. Idle-Flow through slots in transition device  
2. Bag in place, flow switches to slots above bag.

3. Spout withdraws after filling bag with pre-determined charge. Bag continues on where fingers on both sides of rails push it to tucking bridge.

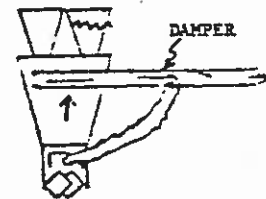
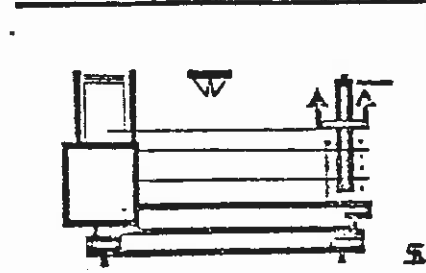


4. With bag positioned under tucking bridge, tucking fingers enter and reform gussets so the filled bag will enter guide mechanism in correct shape.

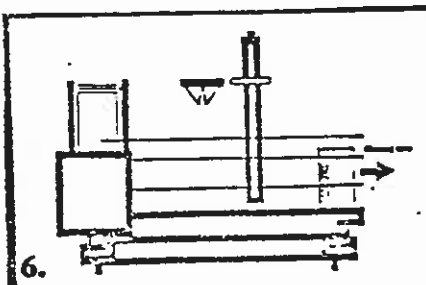


3. Discharge of product into bag - flow through slots above bag (second hopper filling)

5. Filled bag's proper shape is maintained by closing guide extensions after gussets are reformed and fingers removed. Bag is now prepared for closing unit.



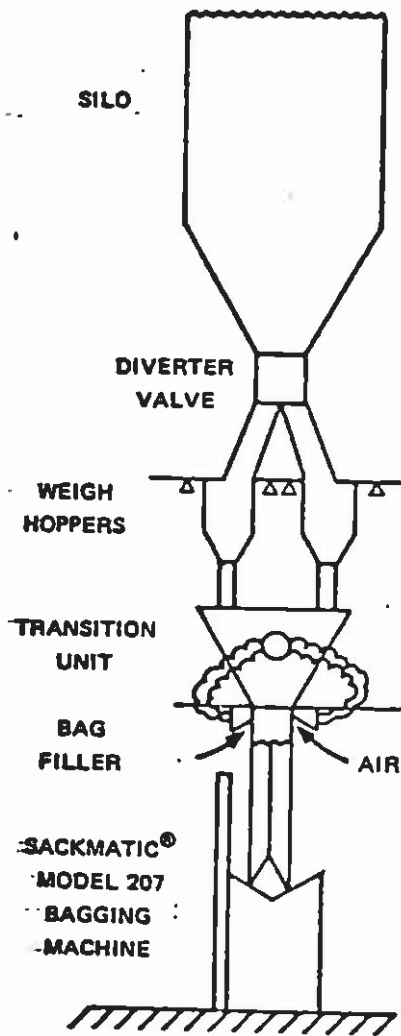
6. Filled bag, fully prepared for final closure by sewing or heat sealing is moved by conveyer belt to closing unit.



4. First bag to sealer  
Second hopper filled, flow through slots in transition device.

An automatic bag caddy feeds plastic lined paper bags toward the filler spout. The mouth of the bag is opened en-route. The clam-shell spout is inserted into the open mouth of the bag and is held firmly in place by external clamps. Once the bag is in place for filling, the air flow switches from the internal duct, with slots inside the transition unit, to slots above the bag. Figure 5 shows the slots above the bag.

Figure 5 - Schematic of Bagger



This procedure prevents the evacuation of the weight hoppers which could otherwise occur if a vacuum is pulled through slots in the transition unit when a bag is in place. Air flow diverted through slots above the bag also catches dust generated externally to the bag during the filling operation.



Once the bag is filled, the spout withdraws, breaking the seal between itself and the bag. Air flow is now diverted to the transition unit in order to prevent the emission of residual dust in the spout and transition unit. The top of the bag is tucked, its side straightened and its mouth sealed by a closing unit with two electrically heated elements. The closing unit is manufactured by Bemis of Minnesota. Each individual operation described is working on bags at all times. In addition to the local ventilation described, the entire line is fitted with a two sided 6 X 2 feet hood (see figure 4). Air in the hood is drawn through six inch ducts attached to the top of the hood into two parallel eight inch ducts which join into a single 10-inch duct which leads to a baghouse on the roof. Design flow data are given below:

Total air flow: 7710 CFM.  
Suction pressure: 8 inches of water S.P.  
Fan: 20 HP, 1800 RPM  
Dust Collector Fan: 21 inch diameter with blast gate.

Filled bags are double checked for weight, placed on pallets, stretch wrapped and transported by forklifts into the warehouse for storage.

#### DESCRIPTION OF PROGRAMS

The plant has a comprehensive industrial hygiene program. Charcoal tube and silica gel sampling are performed on a quarterly schedule. Filter sampling (gravimetric) and piezobalance sampling are also used. There are monthly safety inspections. New employees are given safety and health training and hazard awareness information for each area listing potentially dangerous materials and their health effects are available to employees. Safety shoes, safety glasses (or goggles), and hard hats are required equipment. Gloves and slicker (rubber) suits are furnished upon request or when needed. Different respirators are available in the entire plant although none is used routinely. Respirators are furnished upon request or by job task assignment. Scott Air Packs may be used in the cleaning of baghouses. Respirators are quantitatively fit-tested in accordance with the acrylonitrile standard. Ear-plug fitting is also available. The facility has a plant nurse and a contract physician. The workplace is cleaned daily and a mechanical floor scrubber manufactured by Tennant of 701 N. Lilac, Minneapolis, Minnesota is used 1-2 times a week or as needed to clean the floor of accumulated dust. The floor scrubber is used only when the ambient temperature is well above freezing and only in the warehousing operation.

The administrative control of scheduling production runs in accordance with climate is used to match the materials handled with climate conditions.

#### RESULTS OF SAMPLING

No samples were taken on this walk-through. Samples will be taken in the event of an in-depth study.

CONCLUSION AND RECOMMENDATION

This bagging operation has features which merit an in-depth study. The operation has good supervision, strict industrial hygiene policies and the company gives close attention to safety and health details. Given an in-depth study, some of the features found here may be successfully adapted for improving worker health and safety in other filling and bagging of 50-lb. (or other sizes) bags.