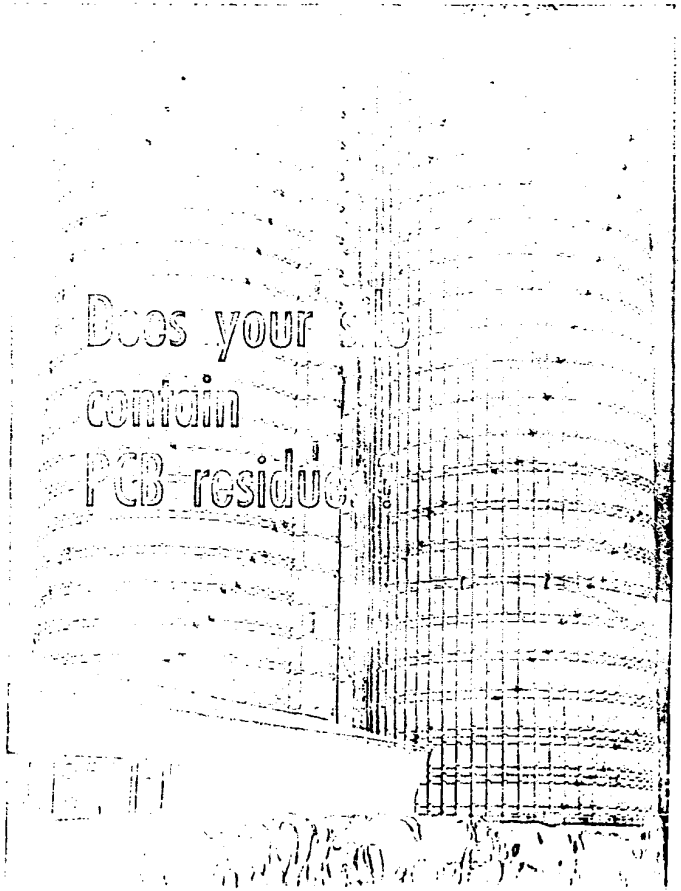


igan, New York, North Carolina, Pennsylvania, South Carolina, Virginia, and West Virginia.

Even though the number of contaminated silos is high, it is not likely that PCB residues in milk present a health hazard to the general public. Since these contaminated silos are scattered within milksheds, the mixed milk supplies do not have significant quantities of PCB residues to pose a health hazard. Surveys by the FDA have confirmed this conclusion.

If a PCB-contaminated silo is on a farm and the farm family consumes the milk produced on that farm, their consumption of the residue will be many times greater than that of the general public. It is not known if long-term exposure to these residues represents a health hazard to the farm family.

Financial hazard to dairyman . . .

There is a serious economic hazard to the dairyman who has a silo that contains PCB residues exceeding the FDA tolerance. This tolerance, or "actionable level," is 5.0 parts per million (ppm) on a fat basis, or 0.2 ppm on a whole milk basis (4 percent fat).

If a regulatory agency detects PCB's greater than tolerance levels, the milk from a dairyman's farm can be excluded from the market until the residue decreases to below the actionable level.

Not only will the dairyman suffer from the lost income, but he also will need to replace the contaminated feed and eliminate the PCB residue from the silo.

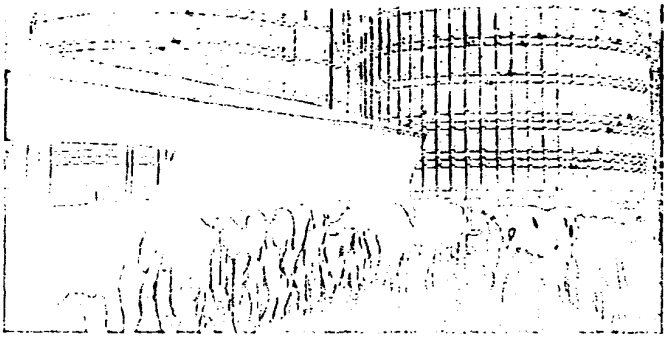
When the cows are producing unmarketable milk, the PCB residue in their body fat is too high for the cattle to be sold for beef. Therefore, the dairyman cannot reduce his losses by selling contaminated cows and replacing them.

To exemplify the financial losses that a dairyman might suffer as the result of a PCB-contaminated silo, let us consider the following hypothetical example:

A dairyman has a PCB-contaminated, 14-by-50 concrete stave silo which contains 150 tons of silage. A residue level of 10 ppm, fat basis, is detected in the milk from his 50 cows which are averaging 40 pounds of milk per day.

With this level of residue, it will probably require about 10 weeks for the residue to decrease below the actionable level. Therefore, if the milk price were $6 per hundredweight, lost milk sales would total $8,400. Replacement of the contaminated silage with hay would cost an additional $2,500 if hay could be purchased at $50 per ton. On top of these expenses, the

HONS 067795



by L. B. Willett

RESIDUES of chemical compounds, identified as polychlorinated biphenyls (PCB's) have been detected in livestock feedstuffs and, subsequently, in meat, eggs, poultry, milk, and fish.

These compounds have a chemical structure very similar to DDT. Because they are fat soluble, PCB's accumulate readily in the body fat of animals which consume contaminated feed. When contamination occurs, food products that are produced by these animals contain PCB residues.

PCB's, like all synthetic chlorinated hydrocarbons, are illegal contaminants of human food. Therefore, the discovery of these compounds has caused concern among those associated with animal agriculture and substantial financial losses to producers who have been directly affected by this contaminant.

PCB in silo coating . . .

A major source of PCB contamination of milk and meat has been silos coated with a material called "Cumar" to prevent leakage and erosion of the walls. (The silo coating called Cumar should not be confused with Neville R-1-6A resin that has the same name.)

Cumar is responsible for most, if not all, of PCB-contaminated silos. The Cumar silo coating contained the PCB called "Arocior 1254."

Arociors were not produced specifically for incorporation into silo coatings but were used because they are good plasticizers. Since the 1930's, Arociors have been adapted to over 50 different industrial and agricultural uses.

The first silos to be coated with Cumar were built in the 1940's. Its use continued through 1970. The exact number or location of the silos that contain PCB contamination is not known since some of the silo companies that used Cumar are no longer operating, and records are no longer available.

However, it has been estimated that 5,000 to 6,000 silos were built which may contain PCB's. Some of these silos have been torn down or are not being used presently.

Most of the silos that are contaminated with PCB's are located in Indiana, Kentucky, Ohio, and Tennessee. Research work and information supplied by silo companies indicate that silos containing PCB residues also have been found in Alabama, Georgia, Illinois, Maryland, Mich-

The author is an assistant professor of dairy science, Ohio Agricultural Research and Development Center, Wooster.

[illegible] contaminated cows and replacing them.

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Test silage and milk . . .

If you suspect that your silo may have been contaminated, even if it was many years ago, make arrangements to have your silage and milk tested for PCB's. The cost of these tests is very small, considering the cost of being excluded from the milk market.

If PCB residues are detected in silage and the residue in milk is above the tolerance-level, stop feeding the contaminated silage immediately. Thoroughly clean the corral and feeding area. Continued feeding of the cows to maintain high production and continued milking of the cows are necessary.

When these procedures are followed, the amount of PCB in milk should drop about 50 percent in 15 days. Thereafter, the decrease should be about 1 percent per day. If feeding is restricted, in order to remove body fat from the animals, it will take much longer for the milk levels of PCB to decrease.

Silage juice dissolves PCB's . . .

Originally, it was thought PCB's from Aroclor-containing coatings contaminated the silage and, in turn, the livestock by flaking off of contaminated chips. It is not uncommon for these chips to contain 5,000 to 10,000 ppm of PCB. Recently, it has been learned, however, that the PCB in the coating material is dissolved by silage juices.

The problems caused by this residue are persistent unless an effective (Turn to page 611)

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Does your silo contain PCB residues?

(Continued from page 610)

barrier is placed between the silage and the silo wall. Once applied to the silo wall, the PCB's penetrate into the concrete and continue slowly to contaminate the silage years after all traces of the original coating are gone.

Silos that were last coated 16 years ago with a material that contained PCB's still cause contamination of the silage and, in turn, the milk produced by animals that consume it. The concentrations of PCB in scrapings from the walls of these old silos have exceeded 600 ppm of Aroclor, and levels in silage adjacent to the wall have exceeded 200.

The most positive way to remove the PCB problem is to stop using the silo or to replace it. This approach is the most positive but is also the most expensive. It will probably cost the dairyman in excess of $4,000 to replace the silo structure.

Results of a research program at the Ohio Agricultural Research and Development Center indicated that PCB residues in contaminated silos can be reduced effectively to tolerable levels. These results have been achieved by carefully cleaning and recoating silos with materials forming a barrier between silage and wall.

The cost of cleaning and recoating a silo is between 10 and 18 percent of the cost of replacing the silo, depending on the type of coating used.

Possibly, the most important aspect of recoating a silo is the cleaning of the silo walls prior to applying the coating. COATINGS WILL NOT BE EFFECTIVE UNLESS YOU PREPARE A CLEAN AND SOLID SURFACE.

Sandblasting is an ideal means to clean the silo; however, the cost makes this method impractical [illegible] concrete surface of a previously contaminated silo. These are:

- a hydraulic cement with an acrylic bonder (not a sand and cement plaster but a cement that forms a watertight barrier)
- a water-based epoxy
- furfuryl alcohol resin

The studies are being continued to determine:

1. If silage from these recoated silos can be fed safely without contaminating the milk.
2. If the coating continues to be an effective barrier when the silo is used continually.

Tests also are in progress to determine if these coatings will be effective when applied to a silo that still retains an intact Cumar coating.

Curtiss Western Sale averaged $2,157

At the Curtiss Western Sale, held at Fresno, Calif., April 6, 42 daughters of Curtiss Holstein bulls averaged $2,157. The sale topper was a $5,500 daughter of Diamond S Magic Knight, consigned by Wes and Tom Sawyer, Waterford, Calif., that was purchased by Sleepy Hollow Certified Farms, Petaluma, Calif. Second high was a heifer calf by Paclamar Astronaut consigned by Tom A. Nunes, Jr., Santa Rosa, Calif., and purchased by Marlowe Nelson, Westby, Wis., for $4,800.

Alex Papageorge and Sons, Ogden, Utah, paid $4,500 for a milking 2-year-old sired by Dee Ann Silver Tim that was consigned by Kenneth and Dean Beer, Berne, Ind. Another "Astronaut" daughter from O. B. Leland, Visalia, Calif., went to Henry Sterk, Chino, Calif., for $3,900.

Every animal in the sale sold for $1,000 or more.

"[illegible] forage harvester"

Now Fox lives up to its reputation for strength—plus gives you the high capacity and convenience you'd expect from the original cylinder-reeutter type

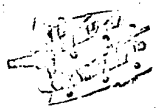
Tough—that's how many owners describe Fox® forage harvesters.

And it's no accident.

Making 'em tough has been our goal for over 40 years.

It's why we've always insisted on welding when others were satisfied to get by with bolts.

Another secret: Every structural part of a Fox is blasted with steel shot—to prepare it for better paint adherence. This also relieves stress and makes the steel surface tougher.



Other Fox benefits:

Extra cutting capacity—with high-speed knife cylinder. Thanks to three knifeheads, you can still set Fox knives to "tick" the shearbar—even at up to 1120 rpm's—for the uniformly cut forage you want.

Extra convenience—with the easiest PTO hookup in the industry. Now hydraulic elbow control is available, too.

Now stop and think.

Who first brought you separate cutting and blowing, square-hole recutter screens, electric knife grinders?

Answer is Fox, of course.

Maybe all this is why Fox is the long-life, high-performance answer to forage harvesting for more and more stockmen.

Check out our pull-type models—2000, 3000 and new 900—or self-propelled models at your Fox dealer.

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silos with materials forming a barrier between silage and wall.

The cost of cleaning and recoating a silo is between 10 and 18 percent of the cost of replacing the silo, depending on the type of coating used.

Possibly, the most important aspect of recoating a silo is the cleaning of the silo walls prior to applying the coating. **COATINGS WILL NOT BE EFFECTIVE UNLESS YOU PREPARE A CLEAN AND SOLID SURFACE.**

Sandblasting is an ideal means to clean the silo; however, the cost makes this method impractical. To prevent widespread contamination, dust must be controlled when sandblasting is used.

Alternatives to sandblasting are wire brushing and high-pressure water — 500 pounds per square inch (psi). The wire brush method requires a great deal of labor. When high-pressure water is used, care must be taken to control the runoff to prevent contamination of streams or other parts of the dairy farm.

Research has provided information about some of the necessary properties of coatings if they are to be used as effective barriers to PCB residues.

First, it is not desirable to use a coating which contains a solvent in which the PCB is very soluble. The solvent in the new coating can dissolve the PCB from the silo wall and simply make it part of the new coating system. A solvent-based coating may actually make the contamination more severe than if no coating at all was used.

Second, the new coating should provide a thick barrier between the contaminated silo wall and the silage. This means that two or more coats of materials which have been tested are necessary.

Of 12 tested, three coating systems appear to be promising as a means of covering the bare con-

were satisfied to get by with bolts.

Another secret: Every structural part of a Fox is blasted with steel shot—to prepare it for better paint adherence. This also relieves stress and



—for the uniformly cut forage you want.

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