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RETROFIT SUCTION AERATION AND CLOSED LOOP FUMIGATION (CLF) SYSTEMS FOR CONCRETE SILOS

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ABSTRACT

Most U.S. concrete elevators silos built from 1950-1975 had no aeration. To manage heating problems, grain was “turned” by transferring to empty silos, a very expensive labor, power intensive process.

Noyes observed that most insects initially infest the surface grain and insect activity reduces proportionally to lowered grain temperatures. He concluded that early control of top grain temperatures by suction cooling would minimize insect populations, providing a sustainable, non-chemical IPM tool. Low airflow suction aeration cools the top 1-2 meters in a few nights.

As part of a *USDA CSREES Sustainable Agriculture Research and Education (SARE) project* in 2002-2004, Noyes designed and built retrofit suction aeration systems for two concrete silo annex elevator facilities in Oklahoma which provided 0.11-0.15 m³/h/t (1/80-1/60 cfm/bu), about 1/2 -1/4 normal silo cooling rates of 0.3-0.4 m³/h/t (1/20-1/30 cfm/bu). For economy, screened suction manifolds were installed over openings cut into sides or sloped tops of grain discharge spouts between grain control slide gates and walls or ceilings of conveyor tunnels. Valves between manifolds and lateral suction pipes are used to control airflow to silos. Grain hotspots are cooled by concentrating airflow to selected silos.

Closed loop fumigation (CLF) for phosphine recirculation is added by connecting a suction pipe from one silo suction manifold (air valve closed) to CLF blower inlet and blower outlets connect to main manifold pipes. CLF blowers pull gas from silo headspaces down through one silo and push it into the bases of all other silos. Closing manifold airflow valves isolate empty silos.