ECONOMIC FEASIBILITY OF PHOSPHINE RECIRCULATION SYSTEMS IN SEALED SILOS AT U.S. GRAIN ELEVATORS

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Closed loop fumigation (CLF) or gas recirculation system for phosphine fumigation using a low volume blower/piping system per tank was patented by James Cook of Houston, TX in 1980. To make CLF more effective, two large steel tanks (2,000 to 10,000 tonnes/tank) were manifolded to one blower in 1992. The manifolded phosphine recirculation (MPR) system design concept was expanded to include concrete silos in 1995 through an EPA grant. To make concrete CLF systems cost effective as 2,000 - 10,000 tonne steel tanks, MPR designs for three to eighteen silos manifolded to one blower were developed as 1,500 - 20,000 tonne storage units in 1995. Economic data on sealing, plumbing and blower equipment costs vs. fumigated storage volume (cost/unit volume) for these concrete silo installations are compared to the twelve steel tank MPR systems in the EPA study. Cost of installed MPR systems and operating cost data from MPR systems built from 1991-1995 are also reviewed.

In this CLF system demonstration, Oklahoma State University supplied almost all of the MPR piping systems, including blowers, for all cooperating elevators. Each elevator manager was responsible for construction/wiring costs to install the system.