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FINAL REPORT

DEMONSTRATION PROJECT
MP/VIE/98/161
CONTRACT 2003/132/VK

Alternatives to the Use of Methyl Bromide (MeBr)
in Fumigation on Stacked Bags of Rice, Grain in Silos,
and Timber in a Warehouse under tarpauline

INTERNATIONAL INSPECTION-FUMIGATION JS CO.
VIETNAM FUMIGATION COMPANY

Vietnam. January 2004

INTRODUCTION

As deadline for complete phase-out of Methyl Bromide is becoming closer, pressure in the call for sound alternative is getting stronger. In Vietnam case, experiments on Phosphine gas from aluminium phosphide and from liquidized form have been under way for some years, though Aluminium Phosphide has gradually achieved acceptable credit in fumigation under tarpaulin and their local consumption grows steadfastly for recent years, the road to an absolute substitute is not all easy.

VFC was assigned for this demonstration project since 1998 preparing for phase out in some 2015 with Phosphine as major alternative to MeBr with commodities are stack bags of rice, grain in silo and timber under tarpaulin. The first phase finished in April 2003 with fair results on Integrated Storage Pest Management, Aluminium Phosphide fumigation in warehouse and sealed silo with J-System, the only issue did not achieved expectation was silo fumigation with SIROFLO with liquidized phosphine in combination with carbon dioxide ECO2FUME with main reason was silo structure and gas distribution system.

The second phase was proposed later on July, 2003 to continue and further application of ECO2FUME in Vietnam in a more diversified site conditions in combination with improvement and mitigation of previous experiment's disadvantages.

- Various types of silos (e.g.: flat bottom, cone bottom)
- Location and points of gas inlets for better penetration
- Silo structure and conditions, gas-tightness for example
- Grain's quality
- Grain loading manner
- Measuring and monitoring method

The result of our second phase was performed in a very tight schedule from 1st October to December 31st, 2003. There were two demonstrations in silos for barley wheat treatment, the first one was performed in silo of Interflour Co. in Ba Ria Vung Tau Province, and the second one is in Binh Dong Flour Co. in Ho Chi Minh City.

The result has shown us much more positive results, for details please refer to following pages but again it could not bring expected outcome in terms of efficacy and economics due to many reasons to be presented later on. In short, there are very good techniques in fumigation presented in the whole course of this project, the point

we all desire to have is strong and sound evidence of their feasibility in replacing Methyl Bromide and their long-term existence in conditions of Vietnam storing facilities, and to achieve this we still need further works to be done.

May we on the completion of this project express our gratitude direction and participation in this project of Multilateral Fund, Ministry of Agriculture and Rural Development of Vietnam, UNIDO Head Quarter In Vienna, UNIDO Vietnam, Vietnam National Ozone Unit - Ozone Office – Hydro meteorological Service of Vietnam, Quarantine Department of Vietnam, Managing Boards of Interflour Company and Binh Dong Flour Company..

Our deepest thanks to people who have assisted us during the time of this project including Mr. Guillermo L. Castella, Mr. Victor Koloskow, Mr. Luong Duc Khoa from Ozone Office, Mr. Robert Ryan of BOC GAS, Mr. Daniel Gock and Ms. Marescia of CYTEC AUSTRALIA Holdings Pty Ltd.,

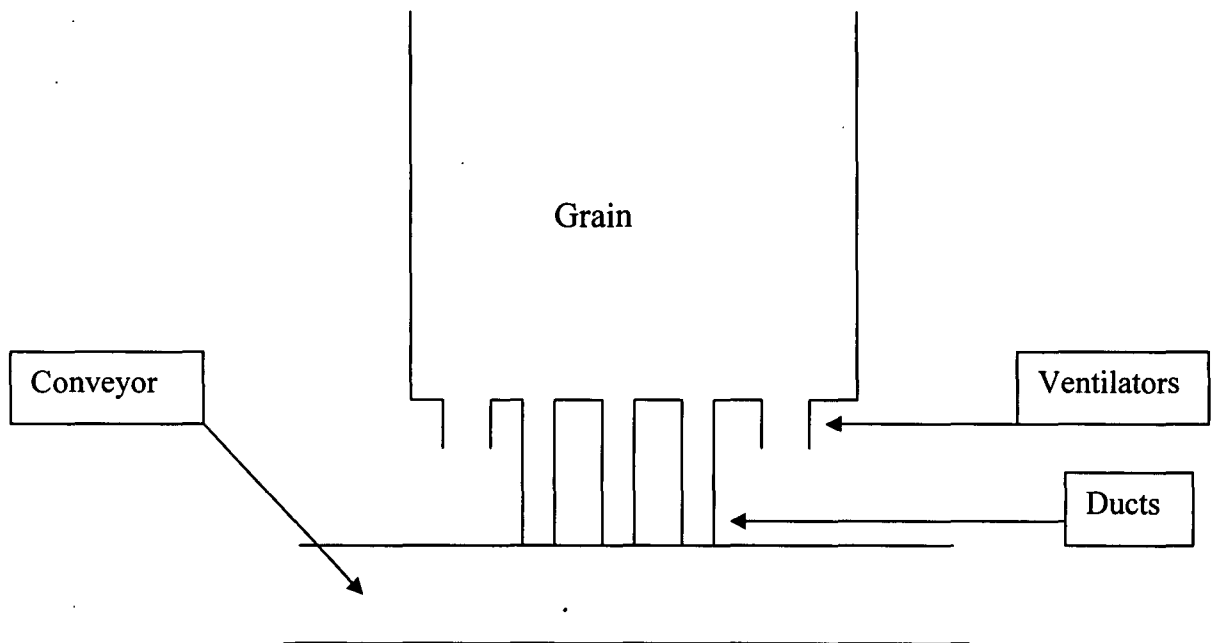
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Ho Chi Minh City, January 8, 2004

**DEMONSTRATION NO. 1
AT INTERFLOUR COMPANY**

1. **Period:** October 16 to October 31, 2003
2. **Description**
 - 2.1 **Location:** The Silo is located at Interflour Co. Premise. in Baria Province, 70km from Ho Chi Minh City, Capacity: 5000MTS, the one is Silo no. 116.
 - 2.2 **Commodity:** Barley wheat, grain loaded full in cone shape up to top which similar to silo shape.
 - 2.3 **Design:** It was designed with flat bottom with 03 ducts and 02 ventilations, fans for ventilation were connected with tunnel at bottom of silo. Silo's walls were made with connected tiles, not properly gas-tight. Silo is located on spacious ground with considerate wind activities. Slit between top and wall is quite broad, on top of silo there are 09 natural ventilators.
Diffuser area: totally 8 m².



3. Activities

3.1 **Installation:** From October 16 we installed pipes, equipment and gas cylinders.

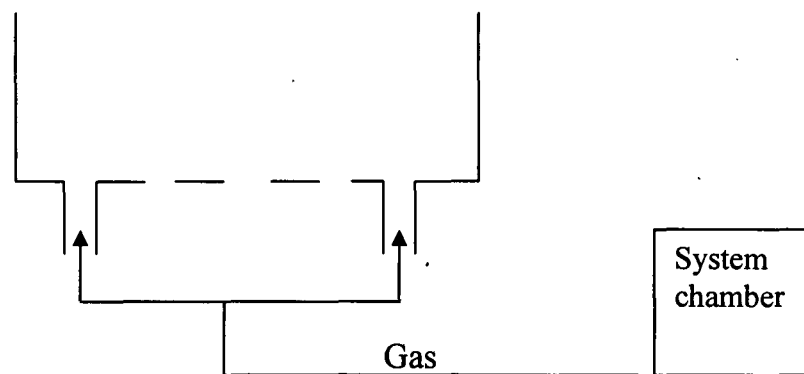
3.2 Preparation

3.2.1. Insect analysis in grain mass was done prior treatment. Result shown in below table:

TABLE 1
INSECT SPECIES AND DENSITY IN WHEAT GRAIN IN SILO NO 116
AT TIME OF TREATMENT IN OCTOBER 2003

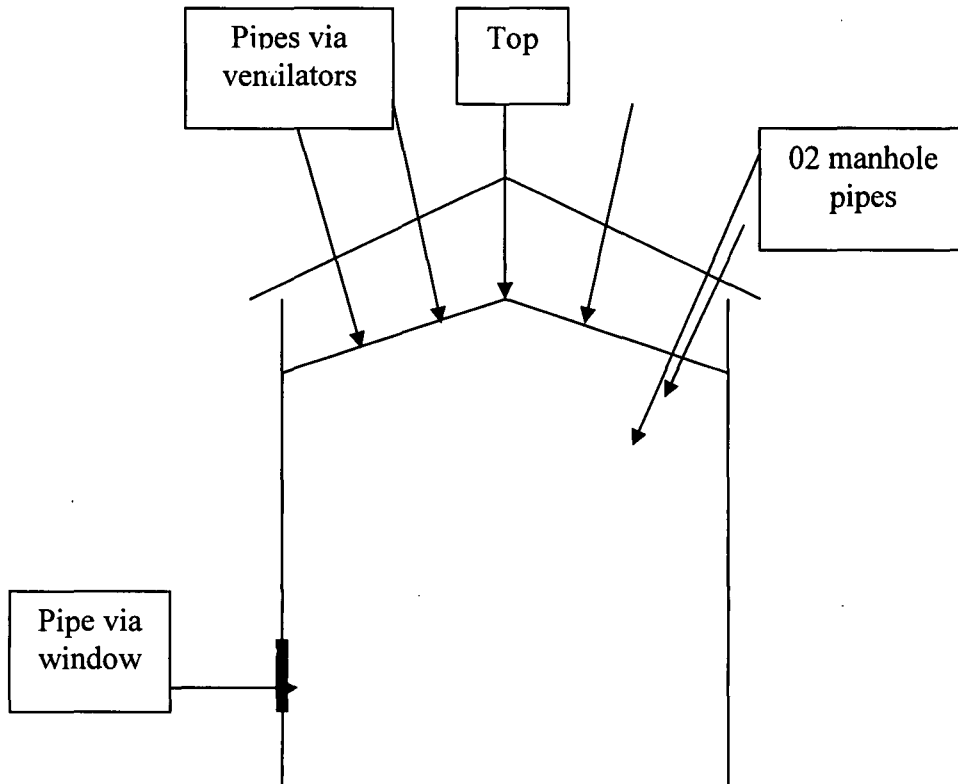
Species of insect	Density (adult/ Kg)
Tribolium castaneum	5
Sitophilus sp.	4
Rhizopertha dominica	5

3.2.2. System chamber was installed at bottom of silo, 03 ducts were shut and sealed air tight, gas from supply system will be directed via 02 pipes of T-shape inlets of electric ventilators into the silo's bottom and they were sealed off also. Before diffusing into grain mass the gas from system would fill up the diffuser (tunnel system).



3.2.3. **Gas Monitoring System:** Gas sampling pipes were placed on top of grain mass via top of silo and three natural ventilators on the roof. At manhole, two pipes inserted into grain mass at different depths (40cm and 1.5m). One pipe was inserted into window to monitor gas along the wall of silo.

LAYOUT OF GAS SAMPLING PIPES



3.2.4. One insect sample was placed on top of the silo from manhole inserted in grain mass at 40 cm deep with **Sitophilus sp.**, **Tribolium paniceum** and **Rhizopertha dominica** to evaluate treatment result.

3.1 Chemical application: 06 cylinder ECO₂FUME (31 kg/cylinder) with monitoring devices. The preparation work at 3 pm October 16 2003 and then gas being released into silo .

At first we controlled parameters as follows:

- System pressure: 500 pa.

- Orifice pressure: 400 pa.
- Flow rate : 3.4 l/m
- Inlet concentration(orifice con.):85 ppm.

After 40 hours on 18 Oct, we checked sampling gas pipes and the results as follows:

- At top surface pipe: 02 ppm
- Vent. 1 surface pipe: 11 ppm
- Vent. 2 surface pipe: 01 ppm
- Vent. 3 surface pipe: 01 ppm
- Manhole P1(0.4m under surface): 44 ppm
- Manhole P1(1.5m under surface): 50 ppm
- Pipe at window(0.1m from wall): 02 ppm

The checking result gave us an early comment that concentration at surface was quite low while in grain mass it was high enough to kill insects. This happened because wind power was very strong and the grain quite full so that the gas lost immediately just as soon as it reached grain surface.

We had some changes in controlling the system on Oct 18, the details as follows:

- System pressure: 480 pa.
- Orifice pressure: 390 pa.
- Flow rate : 3.4 l/m
- inlet concentration(orifice con.):90 ppm.

After 02 days, on Oct 20 we checked again and the result changed a little.

- At top surface pipe: 02 ppm
- Vent. 1 surface pipe: 09 ppm
- Vent. 2 surface pipe: 01 ppm
- Vent. 3 surface pipe: 01 ppm
- Manhole P1(0.4m under surface): 50 ppm
- Manhole P1(1.5m under surface): 52 ppm
- Pipe at window(0.1m from wall): 02 ppm

The system parameters were maintained and the concentration checked again after 01 day, Oct 21 2003. We got the result as follows:

- At top surface pipe: 03 ppm
- Vent. 1 surface pipe: 07 ppm
- Vent. 2 surface pipe: 03 ppm
- Vent. 3 surface pipe: 02 ppm
- Manhole P1(0.4m under surface): 45 ppm
- Manhole P1(1.5m under surface): 56 ppm

- Pipe at window(0.1m from wall): 02 ppm

We decided to seal silo wall 5 meters from bottom by the way keep system parameters no change in order to get a better result. On Oct 23 we checked concentration again and the result was not better.

- At top surface pipe: 01 ppm
- Vent. 1 surface pipe: 05 ppm
- Vent. 2 surface pipe: 02 ppm
- Vent. 3 surface pipe: 02 ppm
- Manhole P1(0.4m under surface): 47 ppm
- Manhole P1(1.5m under surface): 49 ppm
- Pipe at window(0.1m from wall): 02 ppm

We decreased the pressure, keep the flow rate to increase inlet concentration with hope that we would get the better result for the next measuring. And the system as follows:

- System pressure: 400 pa.
- Orifice pressure: 320 pa.
- Flow rate : 3.4 l/m
- Inlet concentration(orifice con.):95 ppm.

On Oct 25 we got a better result but only in grain mass, on surface the concentration was still quite low:

- At top surface pipe: 04 ppm
- Vent. 1 surface pipe: 12 ppm
- Vent. 2 surface pipe: 01 ppm
- Vent. 3 surface pipe: 02 ppm
- Manhole P1(0.4m under surface): 58 ppm
- Manhole P1(1.5m under surface): 61 ppm
- Pipe at window(0.1m from wall): 02 ppm

The system parameters were maintained from that to the end of the experiment and we got the results following days as follows:

Oct 27 2003:

- At top surface pipe: 03 ppm
- Vent. 1 surface pipe: 04 ppm
- Vent. 2 surface pipe: 02 ppm
- Vent. 3 surface pipe: 01 ppm
- Manhole P1(0.4m under surface): 63 ppm
- Manhole P1(1.5m under surface): 73 ppm

- Pipe at window(0.1m from wall): 02 ppm

Oct 29 2003:

- At top surface pipe: 03 ppm
- Vent. 1 surface pipe: 01 ppm
- Vent. 2 surface pipe: 02 ppm
- Vent. 3 surface pipe: 01 ppm
- Manhole P1(0.4m under surface): 65 ppm
- Manhole P1(1.5m under surface): 79 ppm
- Pipe at window(0.1m from wall): 02 ppm

And Oct 31 2003, the last day of the experiment the result as follows:

- At top surface pipe: 04 ppm
- Vent. 1 surface pipe: 02 ppm
- Vent. 2 surface pipe: 03 ppm
- Vent. 3 surface pipe: 02 ppm
- Manhole P1(0.4m under surface): 63 ppm
- Manhole P1(1.5m under surface): 74 ppm
- Pipe at window(0.1m from wall): 02 ppm

Total amount of ECO₂FUME used in this demonstration is 100 kg.

3.2 Bioassay:

We stop the system and checked the insect sample. We found that **absolute control on Tribolium castaneum, some Sitophilus sp. still alive, and all Rhizopertha dominica survived.** From this record, resistance of Rhizopertha dominica may be stronger than other species, applied rate could not afford proper control.

**TABLE 2
GAS CONCENTRATIONS
AND CONTROL SYSTEM PARAMETERS RECORDS**

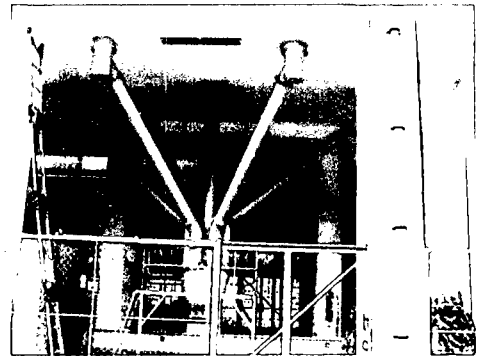
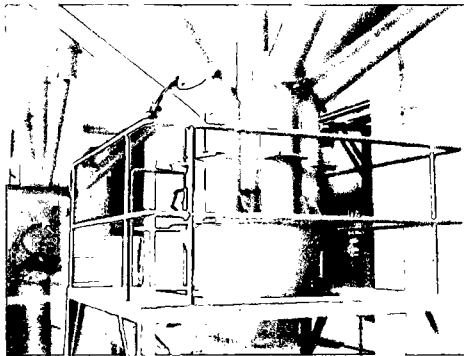
Time	Concentration at sampling pipes (ppm)						
	At top surface Pipe	Vent.1 surface Pipe	Vent.2 Surface Pipe	Vent. 3 surface Pipe 3	Manhole P1(0.4m under surface)	Manhole P2(1.5m under surface)	Pipe at Window (0.1m from wall)
Oct 16 2003	System Pres: 500 pa; Flow rate: 3.4 l/m; Inlet con.: 85 ppm						
Oct 18 2003	02	11	01	01	44	50	02
	System Pres: 480 pa; Flow rate: 3.4 l/m; Inlet con.: 90 ppm						
Oct 20 2003	02	09	01	01	50	52	02
	System Pres: 480 pa; Flow rate: 3.4 l/m; Inlet con.: 90 ppm						
Oct 21 2003	03	07	03	02	45	56	02
	System Pres: 480 pa; Flow rate: 3.4 l/m; Inlet con.: 90 ppm						
Oct 23 2003	01	05	02	02	47	49	02
	System Pres: 400 pa; Flow rate: 3.4 l/m; Inlet con.: 95 ppm						
Oct 25 2003	04	12	01	02	58	61	02
	System Pres: 400 pa; Flow rate: 3.4 l/m; Inlet con.: 95 ppm						
Oct 27 2003	03	04	02	01	63	73	02
	System Pres: 400 pa; Flow rate: 3.4 l/m; Inlet con.: 95 ppm						
Oct 29 2003	03	01	02	01	65	79	02
	System Pres: 400 pa; Flow rate: 3.4 l/m; Inlet con.: 95 ppm						
Oct 31 2003	04	02	03	02	63	74	02
	Stop system, End work.						

4. **Results and comments:**

- Concentration at top of silo reached designed level according to spread sheet, still it did not stay stable after measuring times, gas from bottom moving upward could not penetrate evenly and through all grain mass. Some negative effect such as chimney effect, convection effect, wind still strongly affected.
- Concentrations at window measuring pipes (on silo wall 5m from bottom) were very low, the nearer to the wall they are, the lower the concentrations were, still concentrations further inside grain mass were higher (e.g. pipe at 10cm concentration 2ppm, pipe at 40cm concentration 15ppm and at 70 cm concentration 23ppm). This showed that pressure of gas mixture were not strong enough to move horizontally to ware silo wall, but affected by chimney effect move upward to silo top. In addition, due to silo wall which were not hermetic seal, wind effect might have vastly affect gas movement inside grain mass.
- Concentrations on top of grain mass were comparatively low and varied among measuring points, the wind power was quite strong that blowed away fumigant gas immediately just as soon as it reached grain surface. In such conditions, even when we can have sufficient dosage in grain mass to kill insects, it is not likely to control insect on top of silo.

DEMONSTRATION 2 AT BINH DONG FLOUR MILL

1. **Period:** 16/12 -30/12/03
2. **Description:**
 - 2.1 **Location:** the silo is located at Binh Dong Flour Co. in District 6, Ho Chi Minh City, 12km from city center. The no. 3 the chosen one was built on the ground not much affected by wind power, ambient temperature during demonstration was around 28-30⁰C
 - 2.2 **Commodity:** 1,100 MTS barley wheat, grain was not loaded full and had stay in silo for appr. 1 month. Since the stock had been taken out, grain mass shape was similar to funnel / V shape, grain surface was 6m from silo top. Temperature was 34⁰C.
 - 2.3 **Design:** Diameter: 9.1m, height: 23m, top cone part: 2.6m height. Silo is flat bottom with seven separate grain outlets distributed evenly at the bottom, diameter of each outlet is 20cm, their ending merged into one big duct before discharge into transporting bell (refer to attached picture). Among 07 outlets, the central one is not equipped with closing/opening valve, therefore grain always filled these space inside duct. Silo wall was made of tile nailed and screwed up carefully, split were sealed off therefore gas-tightness seems fair enough. There is no ventilation on top of silo, split between top of silo, roofing and silo wall was very small. In addition there is neither ventilation nor natural diffuser at the bottom of silo.



Layout of Silo's bottom

3. Activities

3.1 **Installation:** from December 16 we installed pipe, equipment and gas cylinder.

3.2 Preparation:

3.2.1 Insect Analysis in grain mass was done prior treatment. Result shown in below table:

TABLE 3
INSECT SPECIES AND DENSITY IN WHEAT GRAIN IN SILO NO 3
AT TIME OF TREATMENT IN DECEMBER 2003

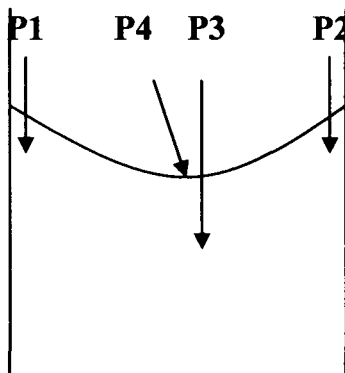
Species of insect	Density (adult/ Kg)
Tribolium castaneum	3
Sitophilus sp.	5
Rhizopertha dominica	3
Hesperus advent	4

3.2.2 We used a plastic pipe 40cm long, diameter 5 cm which was drilled 16 lines of hole, each line with 20 holes (hole dia. 02 mm total appr. 320 holes) inserted into the duct to transmit gas inside and make it smooth for better penetration into grain inside duct and move further.

3.2.3 Sealing: it was done with silicon to all holes, crevices at open/closing valves at the bottom of silo, then we install and fixed perforated pipe inside Duct at silo bottom, in the mean time sealed this pipe and all crevice possible on outlets so as we could secure gas flow with minimized gas loss before gas could go into grain mass.

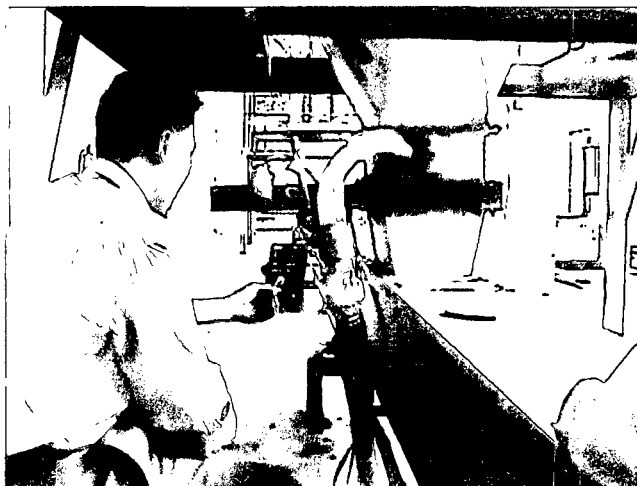
3.2.4 Piping for gas sampling: we arranged on grain surface 4 pipes for gas sampling and concentration measurement, pipe 1 and pipe 2 were inserted deep into grain mass at 50 cm depth away from silo wall 10cm, pipe 3 inserted at 100cm depth in the center of grain surface; pipe 4 on center of grain surface. (refer to following lay out)

LAYOUT OF GAS SAMPLING PIPES



3.3.3.4 Insect bag was a cotton bag containing wheat barley and insects (including **Tribolium castaneum**, **Sitophilus sp.**, **Rhizopertha dominica**, **Ahasverus advena** and **Alphitobius sp.**) placed on top of grain mass 40cm deep for checking result of treatment.

3.3 Steps in demonstration



The demonstration was proceeded after we had completed all preparing at 15.00 on December 16, 2003, the gas was pumped into silo. Starting figures were as follows:

- System pressure: 500 pa.
- Orifice pressure: 400 pa.
- Flow rate : 1.36 l/m
- Inlet concentration(orifice con.): 90 ppm.

After 24 hours on 17 Dec, we checked pipes (all pipe for gas sampling on top of grain mass we named them P1, P2, P3, P4 show zero ppm). It could give an early comment on this figures due to the fact that total diffuser area is small with structure of separate outlets different to other silo used in previous demonstrations) there was possibility that penetration of gas was a bit different and its movement were slow down.

After reading this figures, we decided to increase to higher level to achieve even penetration in grain mass.

- System pressure: 800 pa.
- Orifice pressure: 700 pa.
- Flow rate : 2.0 l/m
- Inlet concentration(orifice con.): 90 ppm.

After 24 hours on Dec. 18, concentration readings were as follows:

- P1 : 40 ppm
- P2 : 42 ppm
- P3 : 45 ppm
- P4 : 15 ppm

The result showed that gas penetrated quite evenly in grain mass, especially concentration on grain surface was higher than previous times in INTERFLOUR, it can say that the grain mass was smaller and shorter from silo top, it also could be that tightness on top of silo was rather secured lead to low level of gas loss.

Through gas concentration readings archived, we acknowledged that they are still low compared to reference materials, it can not bring absolute control on insects (not sufficient dosage). Therefore we decided to increase dosage, maintain flow rate, reduce system pressure. Details as follows:

- System pressure: 600 pa.
- Orifice pressure: 500 pa.
- Flow rate : 2.0 l/m
- Inlet concentration(orifice con.):110 ppm.

On Dec. 19, 2003 We checked concentration again and found following result:

- P1: 55 ppm
- P2: 55 ppm
- P3: 71 ppm
- P4: 05 ppm

System Figures concerning flow rate, pressure, ect. remained for follow-up on the day after. On Dec. 20, 2003 gas readings were as follows:

- P1: 77 ppm
- P2: 75 ppm
- P3: 93 ppm
- P4: 38 ppm

Therefore, by adjustment of system figures one day is not enough to show considerate gas reading on grain surface, 24 hours is not sufficient for gas penetration in the whole grain mass, especially gas existence in upper grain surface, it must wait until the second day for clear difference. This explains why after 24hours gas has not reached grain surface.

With achieved results on concentration and penetration, pressure and flow rate was adjusted accordingly down, inlet concentration remained at 110ppm. Details as follows:

- System pressure: 500 pa
- Orifice pressure: 400 pa
- Flow rate : 1.5 l/m
- Orifice concentration: 110 ppm

From this adjustment, readings on Dec. 21 were as follows:

- P1: 78 ppm
- P2: 80 ppm
- P3: 94 ppm
- P4: 50 ppm

This is quite a good result in regard of concentration to approach absolute control in grain mass, for this reasons these system figures remained throughout the experiment till the end for the sake of expected results. Gas reading samples show small fluctuation depending on wind power and some other environmental issues.

Total Amount of ECO₂FUME used in this demonstration is 70 kg.

TABLE 4
RESULT ON MEASURING CONCENTRATION AT TOP OF SILO AND
CONTROLLING SYSTEM PARAMETERS

Time	Concentration (ppm)			
	Pipe 1	Pipe 2	Pipe 3	Pipe 4
Dec 16 2003	System Pres:500pa; Orifice Pres: 400pa; Flow rate: 1.36l/m; Inlet con: 90ppm			
Dec 17 2003	0	0	0	0
	System Pres:800pa; Orifice Pres: 700pa; Flow rate: 2.0l/m; Inlet con: 90ppm			
Dec 18 2003	40	42	45	15
	System Pres:600pa; Orifice Pres: 500pa; Flow rate: 2.0l/m; Inlet con: 110ppm			
Dec 19 2003	55	55	71	05
	System Pres:600pa; Orifice Pres: 500pa; Flow rate: 2.0l/m; Inlet con: 110ppm			
Dec 20 2003	77	75	93	38
	System Pres:500pa; Orifice Pres: 400pa; Flow rate: 1.5l/m; Inlet con: 110ppm			
Dec 21 2003	78	80	94	50
	System Pres:500pa; Orifice Pres: 400pa; Flow rate: 1.5l/m; Inlet con: 110ppm			
Dec 22 2003	75	76	88	42
	System Pres:500pa; Orifice Pres: 400pa; Flow rate: 1.5l/m; Inlet con: 110ppm			
Dec 24 2003	76	77	80	38
	System Pres:500pa; Orifice Pres: 400pa; Flow rate: 1.5l/m; Inlet con: 110ppm			
Dec 26 2003	71	70	75	15
	System Pres:500pa; Orifice Pres: 400pa; Flow rate: 1.5l/m; Inlet con: 110ppm			
Dec 29 2003	74	75	81	31
	System Pres:500pa; Orifice Pres: 400pa; Flow rate: 1.5l/m; Inlet con: 110ppm			
Dec 30 2003	78	79	84	40
	Stop system, end work.			

3.4 Bioassay

After treatment completion, we have proceeded to analyze results on two insect samples (one of them inserted inside grain mass at 40cm deep with five species as mentioned above, the other was put on grain surface to check the absolute control if possible of technology)

The results show following facts:

- Sample on surface of grain: sample taken on surface we found 4 species Tribolium castaneum, Sitophilus sp., Rhizopertha dominica and Ahasverus advena, Sitophilus sp. and Tribolium castaneum were eliminated absolutely, meanwhile Rhizopertha dominica and Ahasverus advena were almost alive.
- Samples inserted in grain mass with 5 species, we found Alphitobius sp., Tribolium castaneum and Sitophilus sp. dead completely meanwhile Rhizopertha dominica and Ahasverus advena again were almost alive.

4. Results and Comments

- Gas distribution is fine and rather even in such a silo with designed structure with ventilations evenly connected to silo chamber, it reflects through small difference between gas concentrations at differing points.
- Gas penetration in grain mass was comparatively slow due to suggested reasons: diffuser area was small, gas was diverted many ways total pressure then was not able to push mixture further into the whole grain mass timely; another reasons, due to foreign substances, fine small flour particles has prevent gas flow movement.
- From our observation, we have seen that at the same gas flow/inlet concentration, concentration on surface still depended a great deal on wind conditions outside. Actually, in windless days, concentrations were higher, and much lower in windy days.
- In addition, silo wall was quite good and *comparatively* gas-tight, special effect on gas distribution such as chimney effect, convection and wind were largely minimized.
- It should be noted that grain in silo at Binh Dong was not full, gas evaporated from surface was slow in contrary to the one in INTERFLOUR where grain is full, thus in demonstration one gas could not kill insects (only 2ppm).

- Though we had quite regular gas distribution in grain mass and it was monitored at rather high level, gas can not control *Rhizopertha dominica* and *Ahasverus advena*, these two species has shown stronger tolerance against Phosphine than others, or we should say Vietnam species *Rhizopertha dominica* and *Ahasverus advena* have resistance against PH_3 .

FINAL CONCLUSIONS AND RECOMMENDATIONS

We would like to present our conclusions from two additional demonstrations of our Project MP/VIE/98/161 Contract 2003/132/VK as follows:

- SIROFLO is a fumigation technique designed with advantages to solve difficulty in silo with non-close top silos, gas-leaking ones. This is indeed a good point in field practice.
- Both demonstrations did not bring up absolute control in grain mass even at higher dosages and concentrations in fact more than technical levels in reference to theory and guidance developed CSIRO and instructions on label.
- Silo and silo wall in particular in Vietnam can not afford air-tightness at expected requirements for this technique, thus wind effect on gas distribution and penetration in grain mass is formidable, in addition to gross loss of gas via silo wall. Wind attack via wall into grain mass thus cause dilution and gas uneven flows at different points with different concentration, this can not assure a proper fumigation.
- Concerning two species *Rhizopertha dominica* and *Ahasverus advena* in Vietnam concentration 50 – 70 ppm in 14 days is not sufficient to kill them due to strong tolerance or even resistance, further study on this issue must be done.
- In order to successfully apply SIROFLO in Vietnam silo wall of local grain trading in Vietnam must be secured for gas-tightness.
- For better result and more absolute control on insects, further trial with different dosages and exposure times are necessary, it all comes from the demand for better theoretical fumigation and evidence as well as experience every time we deal with silo treatment by PH_3 with SIROFLO.
- In order to apply further and broader this method in Vietnam an absolute control is a must, second is suitable pricing for equipment and chemicals.

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