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Controlled Atmospheres & Fumigation for Stored Product Protection

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Stored Products

AGRICULTURAL		ANIMAL
Durables (Dry)	Perishables (Fresh) Cut flowers, fruits, tubers & vegetables	Edible Milk powder, cheese, dried fish
Food- raw (Cereals, pulses, oilseeds, dry fruits, tree nuts, spices, beverage crops, cassava)		Non-edible Animal feeds, hides and skins, horns and hooves, wool and woolen materials, silkworm cocoons, bone meal, animal specimens, museum exhibits
- processed (Flour, semolina, pasta, powdered spices, cocoa powder, coffee seeds)		
Non-food (Tobacco, cotton, dried flowers, seed materials, oilcakes/meals, whole logs, timber, cultural artefacts)		

Pest attack starts from production till end use

- Intact raw food commodities
- Processed/milled products
- Packaged products
- Processing facilities
- Transport facilities
- Storage facilities



Pest management is essential as infestation leads to....

1

Quantitative loss

2

Product contamination

3

Moisture increase,
moulds, mycotoxin issues

Marketability of the commodity is affected

Pest control options

Chemical Fumigants

- ☐ Fast action
- ☐ Major role in QPS
- ☐ Versatile applicability

Controlled Atmosphere

- ☐ Residue-free
- ☐ Preferred for organic market
- ☐ Long term storage suitable

	Fumigants	Global status
1	Phosphine (AlP, MgP)	Worldwide use
2	Methyl bromide	QPS & CUE
3	Sulfuryl fluoride	Some countries
4	Ethyl formate	Some countries
5	HCN	Europe
6	Ethane dinitrile	Australia, New Zealand
7	Propylene oxide	USA, Japan

Registered Fumigants, India

FUMIGANT	FORMULATIONS
1. Aluminium phosphide (Phosphine)	Tablets- 56%, 6%, 15% (12g), Powder-56% & Granules- 77.5% (Total 5 formulations)
Magnesium phosphide (Phosphine)	56% FI & FIM (2 formulations)
2. Methyl bromide	99% L, 98% L (+2% CPN) (2 formulations)
3. EDCT	3:1 mixture (1 formulation)

Loss prevention at Farmer level



Rigid container, 15% AIP
12 g tablets x 4 or 5 nos

Pouch contains 56% AIP
10 g powder per pack

Loss prevention at state/central storage level Shee
fumigation of bag-stacks with ALP (phosphine)
tablets/sachet



Loss prevention at bulk storage level

Phosphine fumigation using on-site generator



PH₃ Monitoring Equipment



Uniphos 350M
PH₃ Leak
Detector



Uniphos
Fumisense
Pro-Hi-Gas
Monitor



4-Zone Automatic PH₃ gas monitor



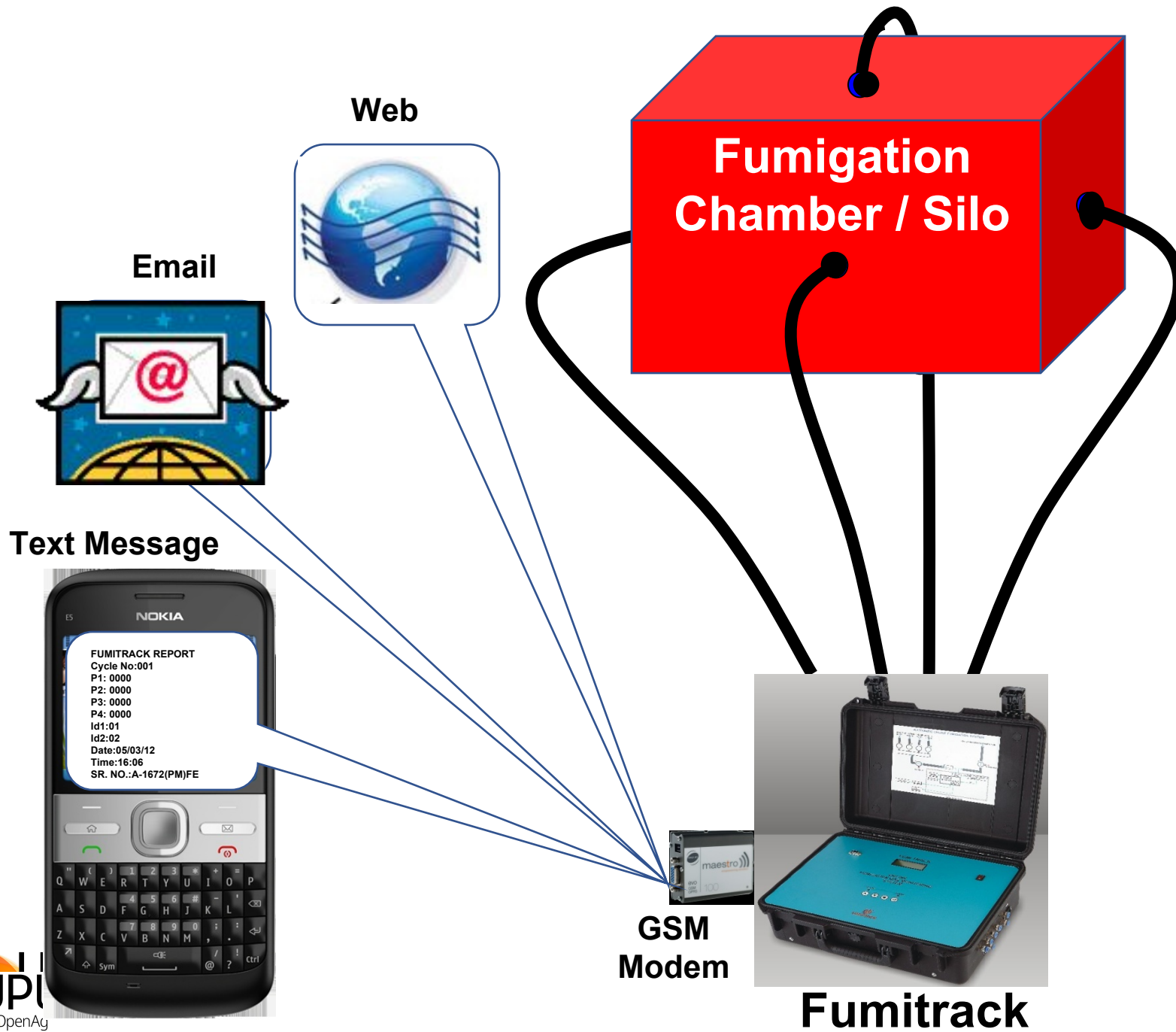
Phosphine Strips



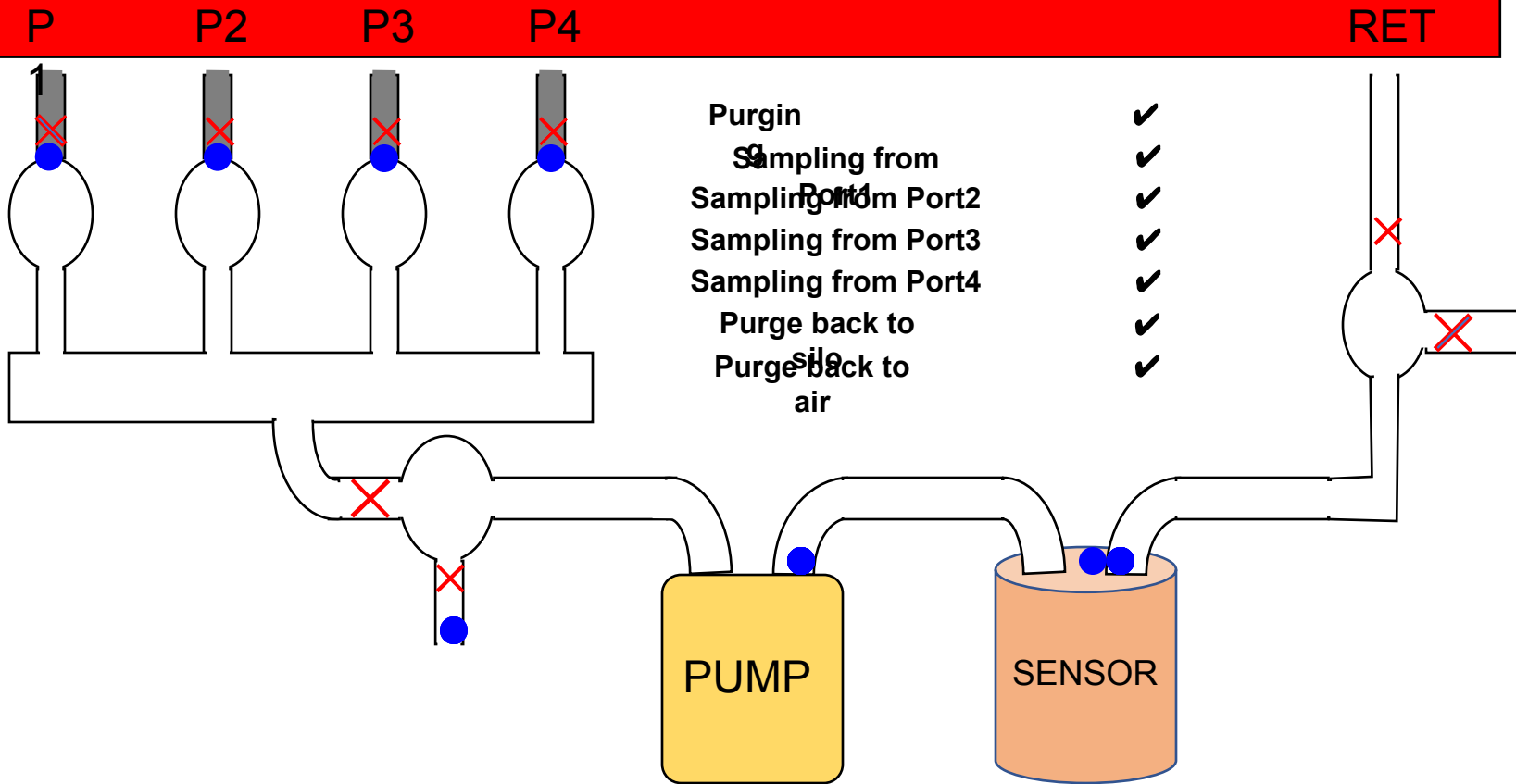
Gas Detection Tubes

Silo fumigation: Fumitrack automated monitoring





FROM FUMIGATION CHAMBER / SILO



Controlled atmosphere (CA) for food commodity storage

Atmos. Gas	Concentration	Exposure time
Low O ₂	≤1% (99% N ₂)	21 days
CO ₂ rich	>35%	15 days

Preparation for CO₂
treatment of *Basmati* rice (2001)



Coffee seed treatment
with CO₂



Now, ready-to-use gastight enclosures, 'cocoons', 1 to 1000 ton storage capacity, are available

Food & non-food industries in India (besides EcO₂/ZerOx/ B-Cat System) use 'cocoons' for hermetic storage & CA treatment





High pressure CO₂ treatment
(very short exposure period)
is yet to be practiced in India

To sum up

The predominant role of chemical fumigants in stored product protection will continue due to rapid action & versatility

CA treatment will have its role in niche areas such as organic market , high-value products & long term storage

Accordingly, fumigants & CA are exploited for loss reduction in stored products & to meet the market demands

Thank you

