

User Success Reports – Commercial Applications of Ozone in Agri-Foods

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TALK OUTLINE

- IOA/PAG Agri-Food Task Force
- User Success Reports – Format
- USRs Posted – Aqueous Ozone
- USRs Posted – Gaseous Ozone
- USRs *in process*
- Summary – Conclusions



IOA/PAG Agri-Food Task Force

- *Agri-Foods Task Force Web Site*
 - www.io3a.org
 - Click on Ozone USRs
 - Click on any asterisked Agri-Food use



IOA/PAG Agri-Food Web Site

- What USRs are all about
- IOA Statement of Policy
- Suggested Format for a USR
- Six Approved and Posted USRs



User Success Report - Format

- Title – Abstract
- Description of Problem
- Description of Plant or Process
- Details of Ozone System and Application
- Case Study Information (next slide)
- Employee Health & Safety Issues
- Submitter—Job title – contact details
- References – original article(s)



CASE STUDY INFORMATION

- Cost savings / ROI
- Shelf-life extension
- Reduction in spoilage
- Improvement in product quality
- Other synergies/additional benefits



USRs Posted -- Aqueous Ozone

- Chiller Water at a Cooked Food Packaging Plant
- Spray Bar System at Garlic Washing & Packaging Plant (peeled and cloves)



USRs Posted -- Gaseous Ozone

- Storage of Harvested Onions
- Potato Treatment & Storage (two cases)
- Ozone Treatment of Grain and Milled Flour

Chiller Water at a Cooked Food Packaging Plant

- ❑ Bean dip, salsa, etc. are cooked, packaged in 5-8 lb lots in plastic bags, then chilled in 5,000 gal tank
- ❑ Prior to ozone, tank was drained 1-7 days (spillage on outside of bags)
- ❑ Now add 1.15 mg/L ozone to tank
- ❑ Water now used up to 6 months
- ❑ O₃ in 3 plants cost \$70,000; saves \$10,600/yr in makeup water + maintenance
- ❑ Plant won \$11,000 in grant from city for water savings (> 1 MM gal/yr)



ONION STORAGE

- ❑ West Coast onion grower - 2003 crop
- ❑ Bulk storage increases problems caused by storage diseases – esp. “neck rot”
- ❑ If storing onions in O₃/air can mitigate the effects of storage diseases, considerable savings can accrue to the onion farmer



WHAT IS “NECK ROT”?

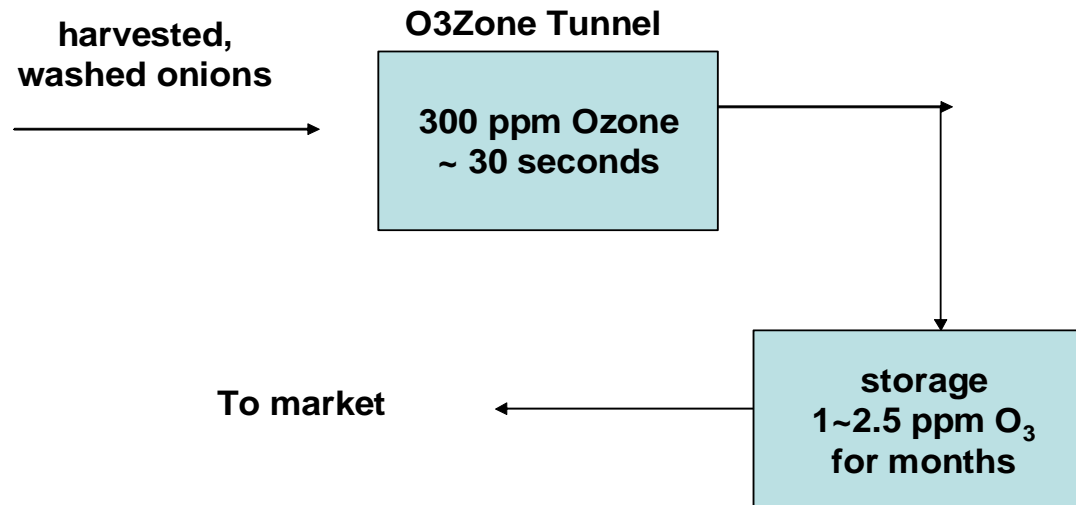
- ❑ A fungus that spreads quickly from onion to onion, regardless of whether the onions are stored in boxes, bags or piled atop each other.
- ❑ Onions surrounding an infected onion become soft and rotten.
- ❑ After applying ozone, the source onions, infected in the field, remained unfit for consumption.
- ❑ *After ozone, the onions surrounding a source onion DID NOT BECOME infected with neck rot.*



EXPECTATIONS w/o O₃

- ❑ 240,000 bags of onions from the 2003 crop were stored in a single shed – 158,000 from one field
- ❑ 30% of the 158,500 bags were contaminated with decay and neck rot
- ❑ w/o O₃, only 20-30% of these contaminated bags would be expected to result in marketable onions
- ❑ The entire stored volume of onions might have been lost had nothing been done to change the expected outcome (ozone was applied)

OZONE APPROACH



Schematic diagram of gas phase ozone treatment and storage process

OZONE COST BENEFITS

- ❑ O₃ treatment resulted in 55,500 *additional* bags of onions being marketable at *an additional* income of \$166,500.
- ❑ Capital cost of the O3Co Ozone Tunnel was \$116,000, including ozone generation and control equipment.
- ❑ Operating costs : 1 lb of ozone requires 10 to 15 kWh. Unit produces ca 3 lbs O₃/day
- ❑ At \$0.10/kwh x 15 kWh x 24 h x 3 lbs/day = \$108/day = ca \$20,000 over 6 months
- ❑ The extra income from just these 55,000 additional bags (\$166,500) more than paid for the ozonation equipment, which is now being used on subsequent crops of stored onions.



POTATO STORAGE-1

- ❑ Washed potatoes are exposed to 300 ppm ozone in O₃ Tunnel (15-30 sec)
- ❑ Once in storage, ozone levels are 1~2.5 ppm for months
- ❑ Ozone eliminates spread of “pink rot”, caused by mold species
- ❑ O₃ Tunnel cost \$116,000 – Potato savings were \$306,000



POTATO STORAGE-2

- ❑ Washed potatoes are exposed to 300 ppm ozone in patented O₃ Tunnel (15-30 sec)
- ❑ Once in storage, ozone levels are 1~2.5 ppm for months
- ❑ Ozone eliminates spread of “pink rot”, caused by mold species
- ❑ O₃ Tunnel cost \$116,000 – Potato savings were \$240,000



Ozone Treatment of Grain in Flour Milling — EPRI Case Study

□ Objectives

- Provide alternative for chlorine
- Reduce microbial counts of flour
- Reduce levels of *E. coli*
- Continuous, automatic application
- On-line electronic controls



UV HOOD in Combination UV/Ozone System





Microbial Counts on Flour

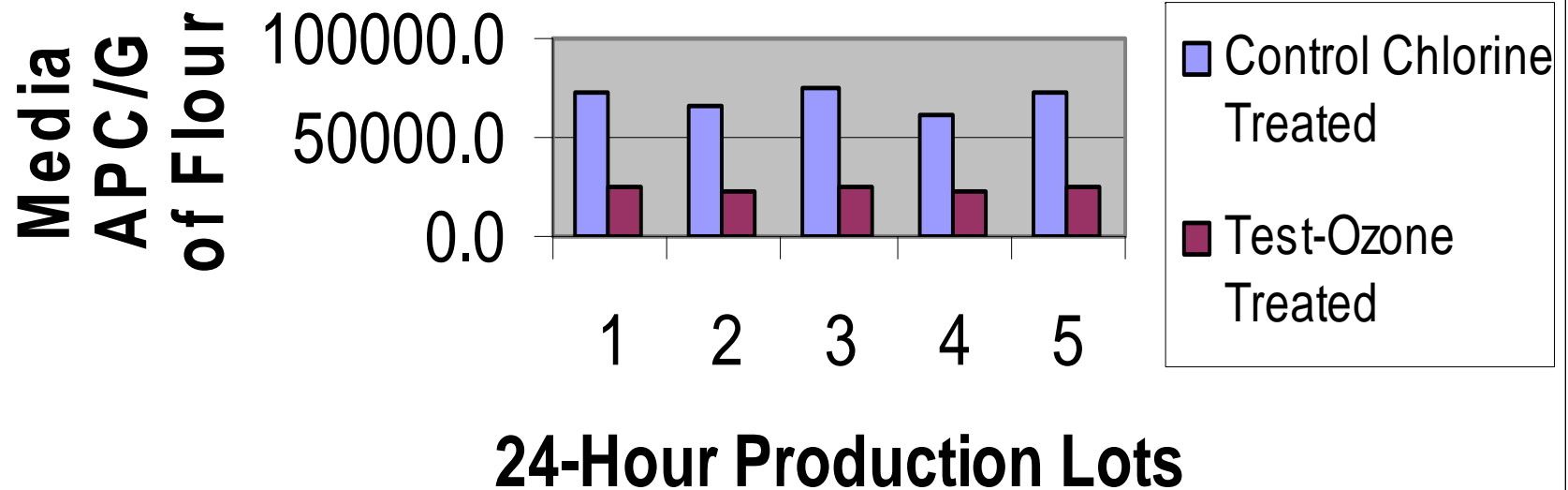
□ Base Line Counts - Chlorinated

- Average APC on flour from 58 carloads - 109,000 to 224,000/g

□ Ozone Treated Grain

- Average APC on flour from 84 carloads - 26,000 to 77,000/g
- 2 later tests showed zero count

**Flour from grain processed with
Chlorine (Control)(63 rail car loads) and
Ozone (Test) (80 rail car loads)**





USRs In Process

- ❑ Strickland Produce – Fresh Cuts
- ❑ Fresher Than Fresh – Fish Processing and Packaging
- ❑ Cakebread Cellars – Winery Uses
- ❑ Silver Star Meats – RTE Meat Plant
- ❑ Plumrose Meats – RTE Meat Plant
- ❑ Sierra Nevada Brewery – Beer



POSTLUDE

- There is plenty of room on the IOA Agri-Food Task Force for interested parties to participate and help promote the uses of ozone in the Agri-Food sectors.
- Come join the IOA and work with us!!
- Next TF meeting – Aug, 2007 (IOA/IUVA World Congress, Los Angeles, CA)