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Environmental Benefits of Using Condensed Natural Smokes™

The use of Condensed Natural Smoke™ provides product improvement and consistency while also building a major platform to build a “Green” program that is both cost effective and current with respect to federal, state, and local environmental regulations.

In an ecologically conscious world, the environmental message associated with the use of Condensed Natural Smoke™ is powerful. Condensed Natural Smoke™ provides cost containment, process efficiency and quality improvement for the processor, while also helping to satisfy five key environmental challenges and sustainability issues:

- *Air quality*
- *Landfill use*
- *Water use and treatment*
- *Energy requirements*
- *Forest resources*

Air Quality

Traditional wood smoke generation creates a major environmental issue for the processor with respect to properly handling smoke emissions. There are two types of air quality issues that confront the traditional smoke user: direct and indirect emissions.

Direct emissions are those combustion products produced by the smoke generator and include particulate matter (PM), carbon monoxide (CO), polycyclic aromatic hydrocarbons (PAHs), organic acids, acrolein, acetaldehyde, formaldehyde, and nitrogen oxides.

Indirect emissions, or volatile organic compounds (VOCs), are those derived from the heating zone areas where air passes over heated coils, resulting in a volatilization of those organic compounds that are contained in the meat or from the smoke originally applied to the meat.[1] All of the direct emission products are harmful and regulated pollutants, while the indirect VOCs may be harmful depending on the type.

Factors impacting the quantity of the polluting emissions include: the amount and type of wood used; smoke duration; and smoke generator temperature (combustion or smolder zone) [2]. A 2003 commercial smokehouse test conducted by Badger Laboratories and Engineering Incorporated compared smoke generation methods for particulate matter and VOCs production.[3]

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Smokehouse Emission Tests *- by Badger Laboratories and Engineering, Inc. – July 29, 2003*						
Smoke Application	**Emission Fraction**					
	Particulate			**Volatile Organic Compounds (VOCs)** *- as Propane*		
	lbs. / hr.	**lbs. / annual**	**% reduction over traditional smoke**	**lbs. / hr.**	**lbs. / annual**	**% reduction over traditional smoke**
Traditional	**0.508**	**31,065**		**1.17**	**71,547**	
Drenching	**0.078**	**4,704**	**84.65**	**0.22**	**13,450**	**81.2**
Atomization	**0.066**	**4,038**	**87.01**	**0.42**	**25,685**	**64.1**

To minimize and control smoke emissions from traditional smoking operations, the processor must invest in expensive afterburners, wet scrubbers, and modular electrostatic precipitators. Additionally, the processor may have to purchase permits to allow such emissions from local and state authorities.[1] Such equipment substantially builds additional costs for operation, maintenance, water consumption, clean-up (chemical cleaners and disposal) and energy.

Besides concerns about air emissions outside the processing facility, traditional smoke generation also impacts the air quality inside the plant through leaks in the smokehouse generators and duct seams. In-plant air quality is also negatively impacted during the removal (cleaning) of the smoke tar residue that deposits on the smokehouse duct work. Caustic or other concentrated cleaners are used to remove such tar residue and may cause eye and air passage irritation for those cleaning the smokehouse system as quality air respirators should be issued.

Landfill Needs

Use of traditional smoking creates large quantities of waste, which increases cost for the processor and adds to the environmental challenge. From sawdust ash cleaned out of the smoke generator, to empty sawdust bags, to cleaning supply containers, the volume of solid waste originating with a traditional smoke facility and destined for the landfill is substantial.

Besides providing an environmental challenge, the costs for such disposal can be significant. In comparing traditional smoke processing to Condensed Natural Smoke™ applications, the traditional smoke processor would need to landfill approximately 100 large

paper bags (five pallets) as well as the resultant ash. Comparatively, the Condensed Natural Smoke™ user could utilize an environmentally friendly reusable tote container (one pallet) to supply their smoke generation needs – without generating any landfill waste.[4]

Additionally, the production of Condensed Natural Smoke™ is an excellent example of green technology. The ash generated in the Condensed Natural Smoke™ pyrolysis (burning) is recycled for in-plant heat generation (sawdust dryer and plant operations), with any remaining ash being utilized as a raw material for road construction.

Water Use and Treatment

Traditional smoking requires frequent cleaning involving caustic and detergent cleaners to remove the tar that lines the smoke generator, smoke ducts, smokehouse walls, and smoke scrubbers. The net result is a large usage of water as well as a water treatment issue with disposal of the dissolved tars and caustic and detergent cleaners.

For example[5], the water requirements for daily cleaning and operation of a 7-house facility (smokehouse, smoke generator, and scrubbers) shows a traditional smoke process would require approximately 9.7 times the amount of water for cleaning and operational purposes than would a 7-house operation utilizing only Condensed Natural Smoke™ (7,490 gals. water vs. 770 gals., assuming no scrubber use for Condensed Natural Smoke™). A typical scrubber will utilize 4 gallons of water/minute during operation. For a 4-hour smoke cycle, that is 960 gallons of water per smokehouse schedule, just for scrubber operation.

Energy Requirements

Use of Condensed Natural Smoke™ reduces the total energy outlay for the processor as compared to use of traditional smoke. Energy (gas/electric) is needed to heat and/or operate the smoke generator, smokehouse, cleaning water, and smoke emission scrubbers. By eliminating the need for the air emission scrubbers and smoke generators, coupled with reducing the duration to smoke (cook) product, the processor will significantly reduce the energy costs per unit weight of smoked product.

To obtain the smoke color and smoke flavor achieved in a 3-hour traditional smoke cycle, only 30 minutes of atomization or 2 minutes of drenching of a Condensed Natural Smoke™ is needed.

Forestry Resources

A 2005 estimate of sawdust-use efficiencies shows a dramatic difference between the wood resources required to produce Condensed Natural Smoke™ versus traditional smoke. To smoke one ton of meat, it was estimated that 15 to 20 kilograms of sawdust would be needed for traditional smoking as compared to only 3 to 5 kilograms to produce the necessary quantity of Condensed Natural Smoke™ – a 4-to 5-fold difference.[6] This efficiency in converting sawdust to usable smoke goes a long way to conserve our valuable and limited hardwood forest resource.

References:

1. U.S. Environmental Protection Agency. 1995. Emission Factor Documentation for AP-42; Section 9.5.2; Meat Smokehouses – Final Report.
2. Red Arrow Technical Report: Traditional and Liquid Smoke Combination. 2006.
3. Badger Laboratories and Engineering Inc. 2003. Emission Studies.
4. Tarber AB. 2009. Wood Chips Facts. From: Tarber AB web site: *www.tarber.se/sidor_eng/TVframes_e.html*.
5. Red Arrow Cost Analysis: Savings and Cost Projections-Bacon Process. August 20, 2008.
6. Lohmeyer, C. 2009. Presentation to the "Italian Meat Association." October, 2009.