Depopulation Methods
• Gassing is a preferred and available option
  – Whole house gassing
  – Partial house gassing
  – Containerized gassing
• Foam depopulation
  – Foam with inert gas
  – Foam without inert gas
• Individual depopulation
• Carbon dioxide (CO$_2$) one of the standard gassing procedures
  – Suitable for field and laboratory
• Established anesthetic effect
  – Birds unconscious during later phases
• Irritant at higher concentrations
  – Faster increasing concentration decrease sensitivity time
• Argon-CO$_2$ gas depopulation evaluated under laboratory conditions
  – Oxygen displacer
  – Increased difficulty in field applications
• Thought to be more “humane”
• Disadvantages
  – Requires extremely high concentrations to be effective
  – Human hazard
  – Rigid gas concentration control

*Ryan et al., 2006*
• Whole house gas procedure
  – Seal the house
  – Inject large volumes of gas
  – Monitor gas concentration

• Suited for tight housing styles
  – Reduce gas loss
  – Sealing can be difficult with some designs

• Requires large volumes of gas
  – Gas injection lance securely fastened

• Can force virus and particles outside the house
• Whole house CO$_2$ used on ~1/2 of farms
  – Mostly for chickens and turkeys farms
• Only able to achieve 40% concentration
• Took ~35 min before birds start to die
• Costly
• Sealing required
  – Doors/fans/vents
• HP liquid CO$_2$
• May cause temperature stress
• Set up time ~1 hr
• CO$_2$ gas existed building in ~15 min
• Developing a manifold system for faster gas delivery to reduce time to death
• Broiler breeder facility
  – 12,000 end of lay birds

• House preparation
  – Vents and openings sealed
  – Birds excluded from discharge area

• CO₂ injection
  – 13.86 ton CO₂ in 40 min
  – 2.5 – 8 min to reach 20% CO₂

• Temperature drop
  – Conscious birds -5.8 C
  – Overall drop -42 C

Ryan et al. (2006)
• Four empty turkey breeder houses
  – Lance injection, 40 min
  – Sealing required, 3.5 hr
  – 40% or greater CO$_2$ concentration

• Closed vents
  – 5.5 Tons CO$_2$

• Open vents
  – 16.5 Tons CO$_2$
  – Considerable losses

Wrigley et al. (2008)
• Used mostly for broiler breeders
• Birds confine to ends of house or scratch area.
• Seal-off or cover birds with polyethylene and introduce CO₂
• Multiple approaches for partial house gassing
• Portable panels
  – Used for ducks and turkeys
  – Panels on both sides of house
  – Litter removed
  – Birds driven to one end
  – Chamber created

Portable panel system in use with turkeys.
• **Specific type of partial house gassing used on Delmarva (2004)**
  - Suitable for broilers
  - Carcasses remain in house
  - Commonly available equipment

• **Disadvantages**
  - Labor intensive
  - Requires knowledge and skill
  - Contaminated polyethylene
  - Not compatible with all housing styles
Polyethylene Tent Procedure
• Fasten or staple plastic to ceiling

Polyethylene Tent Method
- Mark cylinder location

- Install CO₂ Cylinders (1 per 15.2 m)

**Polyethylene Tent Method**
Polyethylene Tent Method
Polyethylene Tent Method
Advantages

- Minimum equipment and cost
- Readily available supplies
- Carcasses not removed

Disadvantages

- Labor intensive (15 – 20 people per house)
- Polyethylene removal and disposal
- Trained personnel required
- Welfare concerns
- Difficult to implement in pole-type houses

Polyethylene Tent Method
• Birds hand caught
• Loading crate placed in chamber
• Gas injected into chamber
• Good control of gas
• Flexible and versatile because of human catchers
• Induce handling stress
• Time and labor intensive
• Potential for high virus exposure
• Biosecurity risk
• Limits disposal options

DEFRA (UK) containerized gassing unit
- **Portable trailer unit**
  - Containers on trailer
  - Gas supply preconnected
- **Birds brought to trailer**
- **Small scale or backyard flocks**
• Containerized methods used for layers
• Requires 8 man crew (catchers, dumper, foreman) with 2 carts
• Euthanize 25 birds at a time, cart holds 200 birds
• Labor intensive, slow process and costly.
• Portable container system developed in Canada
• Skid steer mounted
• Plastic bin, CO$_2$ cylinder, vaporizer and propane tank.
• Catchers can load 640 birds/12 minutes (~2900 birds/hr if dump next to bin)
• Place ~60 layers in CO₂ charged cans.
• Cans may be slightly faster than carts
• Cans readily available in an emergency.
• Labor intensive and slow
• CO₂ source not with can
### Advantages

- Good control of gas concentration
- Commercially available or services provided
- Type of housing not an issue

### Disadvantages

- Labor intensive
- Induces handling stress
- Remove birds from houses (biosecurity risk)
- **Personal protective equipment essential**
  - Protective suit, gloves, hair covering, goggles, N95 or greater, boots
  - Increases difficulty of operation
  - Decreases endurance and performance
- **For any gassing operation**
  - SCBA-equipped personnel enter the house
  - Monitor environment until $\text{CO}_2 (<5000 \text{ ppm})$ and $\text{O}_2$ levels (>19.5%) are safe

*Operator equipped with SCBA for entering a gassed poultry house.*
Will there be adequate workers to respond to an AI outbreak?

Oversight of Workers

- Stress Counselor
- Euthanasia Team Manager
- Safety Officer
- Peer Pressure
- Family Pressure
- Animal Welfare Officer
- Public Health Officer