# ZERO ENERY COOL CHAMBER (1 MT model)

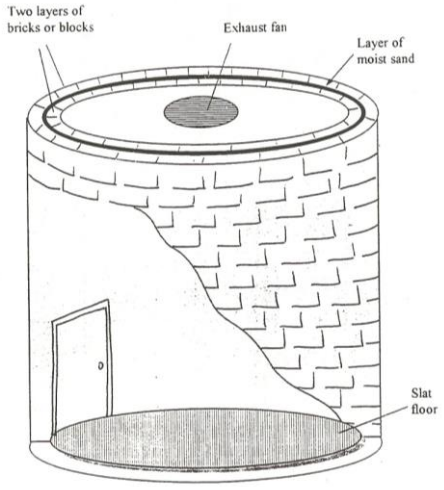
**Introduction:** This storage structure is called an improved “Zero-Energy Cool Chamber" (ZECC) because it uses no external energy. The low cost cooling chamber is constructed from porous clay bricks. The cavity between the walls is filled with clean sand and the bricks and sand are kept saturated with water. Fruits and vegetables are loaded inside, and the entire chamber is covered with a rush mat, which is also kept moist. During the hot summer months in India, this chamber can maintain an inside temperature between 15 and 18 °C (59 and 65 °F) and a relative humidity of about 95% (Roy 1989). Results are best when the relative humidity conditions outside the ZECC are low, as during the dry season or in semi-arid regions.

Large versions of the original model chamber were constructed in the design of a walk-along style cool chamber under shade, and as a small cold room (6 to 8MT capacity), which requires the addition of a small water pump and a ventilation fan at the roof line (similar to the attic fans used in US homes). Since a relatively large amount of materials are required to construct these cold storage chambers, they may be most practical when handling high value products.

**Design Options & Materials Needed**

*India design for 1MT capacity Walk-along ZECC for the APT project, 2009 Source: Saran et al 2012*

The 8MT model shown here is square in shape, but the structure can also be made as a tall round room as shown below. The corners and walls are reinforced with strong metal rebar and cement. A false floor provides an air space under the load for cool air to be drawn in under the entire cool room.




*8MT sized ZECC walk-in cool room (constructed at IARI, New Delhi)*

**Costs & Benefits**

The cost for construction of the 1MT capacity walk-along ZECC was $1000 and the cost of the commercial sized unit is estimated to be $8,000. Postharvest losses were reduced for a variety of tropical and sub-tropical crops from an average of 30% to 40% when handled at ambient temperatures to less than 10% when stored in the ZECC, and quality was well maintained for up to 10 days.

| Crop (1000 kg) | Ambient temperature handling and immediate marketing in reusable baskets | Cool storage for one week in the ZECC in plastic crates | Potential increase in profits |
|---|---|---|---|
| Tomatoes | $0.02 per kg handling costs<br>Market price $1.00 per kg<br>Postharvest losses = 30%<br>Market value = $980 – 300 = $680 | $0.06 per kg handling costs<br>Market price $1.00 per kg<br>Postharvest losses = 5%<br>Market value = $940 – 50 = $890 | $210<br><br>5 uses of the ZECC will pay for the investment |
| Leafy green vegetables | $0.02 per kg handling costs<br>Market price $2.00 per kg<br>Postharvest losses = 40%<br>Market value = $1980 – 400 = $1580 | $0.06 per kg handling costs<br>Market price $2.00 per kg<br>Postharvest losses = 10%<br>Market value = $1940 – 100 = $1840 | $260<br><br>4 uses of the ZECC will pay for the investment |

**References cited**

Roy S.K. 1989. Postharvest technology of vegetable crops in India. Indian Horticulture. Jan-June: 76-78.

Saran S, Roy S K and Kitinoja L (2012). Appropriate Postharvest Technologies for Improving Market Access and Incomes for Small Horticultural Farmers in Sub- Saharan Africa and South Asia. Part 2: Field Trial Results and Identification of Research Needs for Selected Crops. *Acta Hort* (IHC 2010) 934: 41-52.

**For further information**

Small-scale postharvest handling practices: A manual for horticultural crops (Chapter 6 and 7; 5th edition 2015) http://ucanr.edu/sites/Postharvest_Technology_Center_/files/231952.pdf

Postharvest Technology Center (UC Davis)
http://postharvest.ucdavis.edu

The Postharvest Education Foundation
http://www.postharvest.org

Postharvest Innovations LLC
http://www.postharvestinnovations.com

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