

Recyclable Caging Study Results:

Broader Applications & Selection Criteria for Today's Project and Cost Drivers

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What drives the decisions to use Individually Ventilated Caging?
And then, recyclable caging?

Selection Criteria

- ✓ Biosecurity / Intracage Environment
- ✓ Capital Costs – Space and Equipment
- ✓ Operating Costs
 - Labor
 - Supplies (including cages)
 - Equipment maintenance and depreciation
 - Utility Consumption – Carbon footprint
- ✓ Sustainability
- ✓ Employee Health – Ergonomics and Particulate/Pathogen Exposure

Conducted Survey of Facilities Using Recyclable Caging

Research Demographic

- Facility Sizes: 1,000 to 20,000+ cages
- Years of Use: 1 to 7 years
- Geography: Western US, Midwestern US, Eastern US, Europe, Japan
- Type of Organization: Universities, Not-For-Profit, Pharma, Biotech, Breeders

Applied an economic model to compare the cost of washable cages to recyclable cages.

Economic Modeling Included Broad Range of Cost Information

Animal Holding Information

- Total cage capacity
- Average cage census
- Cage change interval
- Rack capacity
- Cost per rack (including extra cages)
- Cost of replacement cages
- Expected life of cage
- Number of technicians
- Technician salary (with benefits)

Washroom Costs

- Cage wash space build-out
- Rack washer
- Tunnel washer
- Autoclave/sterilizer
- Bedding handling equipment
- Annual utilities
- Annual bedding cost
- Number of washroom staff
- Washroom staff salary (with benefits)

Some Costs Are More Difficult to Collect

EXCLUDED FROM ANALYSIS

- Washroom HVAC utility costs
- Occupancy costs
- Grievances, absenteeism
- Overtime
- Long-term occupational health costs
- Financial flexibility

Total Cost of Running a Washable Caging Facility over 10 Years

WASHABLE CAGING EXPENDITURES

EQUIPMENT	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total number of racks	13	13	13	13	13	13	13	13	13	13
Cost of racks including cages	\$301,876	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cost of additional cages	\$11,880	\$0	\$0	\$0	\$5,940	\$5,940	\$0	\$0	\$5,940	\$5,940
Annual cage replacement cost	\$0	\$0	\$0	\$0	\$22,858	\$22,858	\$0	\$0	\$22,858	\$22,858
Water pouches plus 0.2 technician	\$25,317	\$25,317	\$25,317	\$25,317	\$25,317	\$25,317	\$25,317	\$25,317	\$25,317	\$25,317
Depreciation Initial racks and cages		\$30,188	\$30,188	\$30,188	\$30,188	\$30,188	\$30,188	\$30,188	\$30,188	\$30,188
Annual cage breakage cost	\$46	\$47	\$47	\$47	\$47	\$47	\$47	\$47	\$47	\$47
Total rack & cage costs:	\$339,118	\$55,551	\$55,551	\$55,551	\$84,349	\$84,349	\$55,551	\$55,551	\$84,349	\$84,349
WASHROOM										
Washroom: Build-out and equipment	\$430,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Depreciation build-out and equipment	\$0	\$25,370	\$25,370	\$25,370	\$25,370	\$25,370	\$25,370	\$25,370	\$25,370	\$25,370
Washroom maintenance and supplies	\$13,678	\$14,088	\$14,510	\$14,946	\$15,394	\$15,856	\$16,332	\$16,822	\$17,326	\$17,846
Annual washroom utilities equip only	\$16,000	\$16,480	\$16,974	\$17,484	\$18,008	\$18,548	\$19,105	\$19,678	\$20,268	\$20,876
Total washroom costs:	\$459,678	\$55,938	\$56,855	\$57,800	\$58,773	\$59,775	\$60,807	\$61,870	\$62,965	\$64,093
LABOR										
Vivarium technicians	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Washroom labor	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total labor costs:	\$74,531	\$74,531	\$74,531	\$74,531	\$74,531	\$74,531	\$74,531	\$74,531	\$74,531	\$74,531
Annual Costs for Cages & Racks:	\$873,327	\$186,020	\$186,937	\$187,882	\$217,653	\$218,655	\$190,889	\$191,952	\$221,845	\$222,973
Cumulative Annual Costs for Cages & Racks:	\$873,327	\$1,059,346.77	\$1,246,284.03	\$1,434,165.83	\$1,651,818.34	\$1,870,472.93	\$2,061,361.81	\$2,253,313.79	\$2,475,158.59	\$2,698,131.22

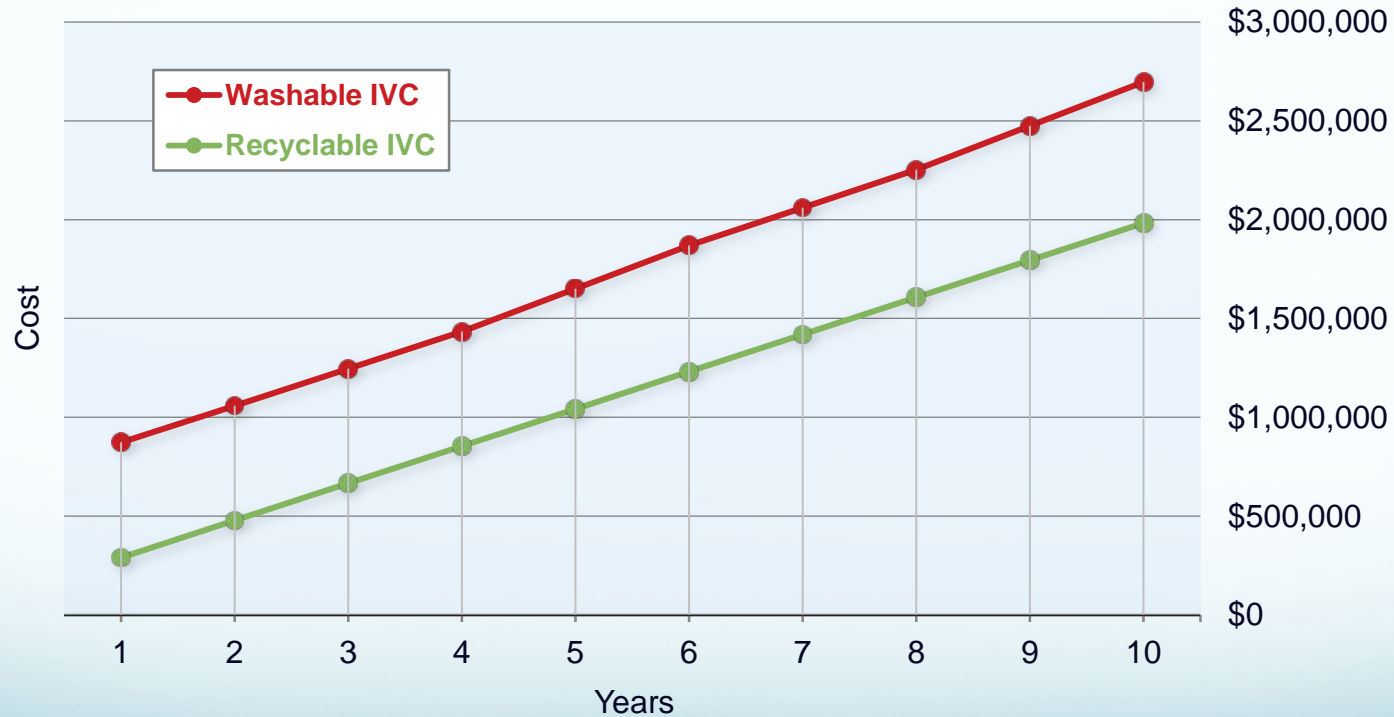
TOTAL COST \$2,698,131.22

Total Cost of Running a Recyclable Caging Facility over 10 Years

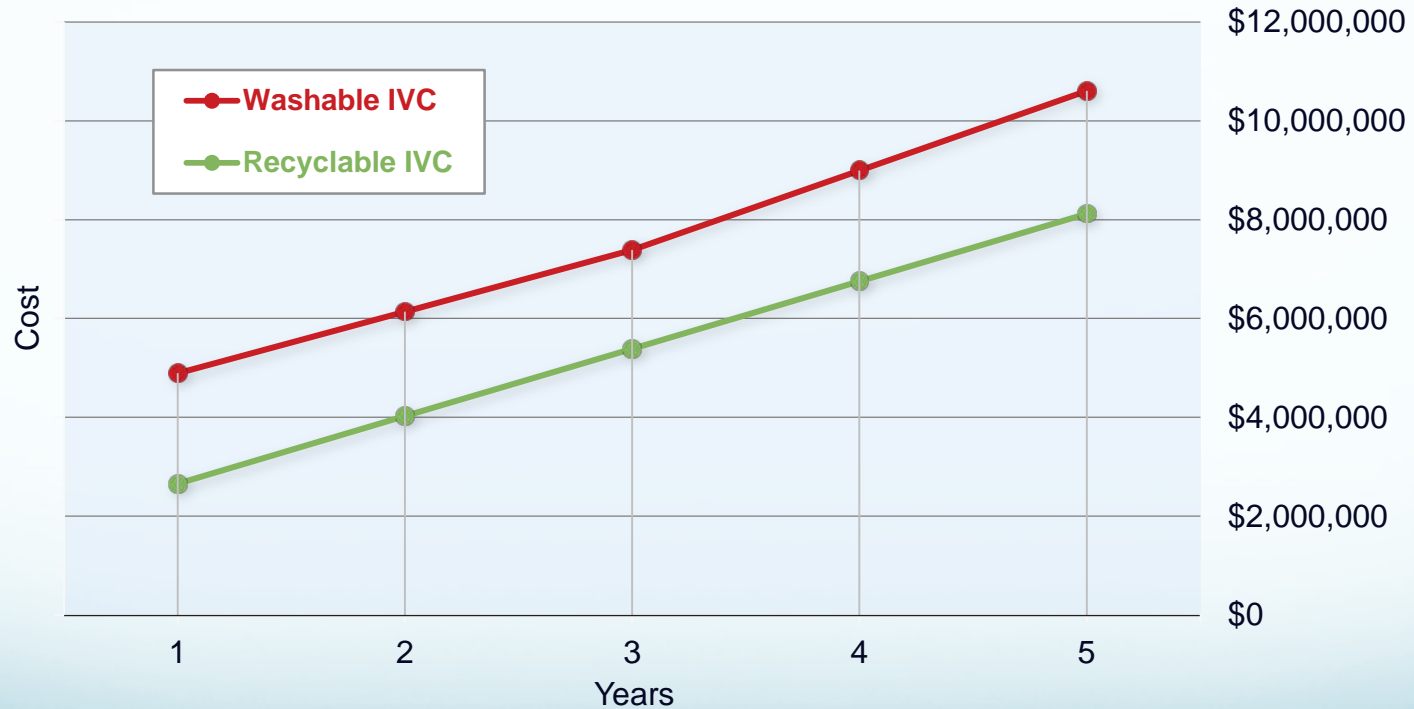
RECYCLABLE CAGING EXPENDITURES										
EQUIPMENT	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Annual cage changes	\$23,327.07	\$23,327.07	\$23,327.07	\$23,327.07	\$23,327.07	\$23,327.07	\$23,327.07	\$23,327.07	\$23,327.07	\$23,327.07
Cost of racks	\$143,585	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Depreciation of racks		\$14,359	\$14,359	\$14,359	\$14,359	\$14,359	\$14,359	\$14,359	\$14,359	\$14,359
Annual cage costs	\$85,898	\$85,898	\$85,898	\$85,898	\$85,898	\$85,898	\$85,898	\$85,898	\$85,898	\$85,898
Total rack & cage costs:	\$229,483	\$100,257	\$100,257	\$100,257	\$100,257	\$100,257	\$100,257	\$100,257	\$100,257	\$100,257
LABOR										
Vivarium technicians	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Bottle and cage handling labor	\$5,426.90	\$5,426.90	\$5,426.90	\$5,426.90	\$5,426.90	\$5,426.90	\$5,426.90	\$5,426.90	\$5,426.90	\$5,426.90
Total labor costs:	\$60,810	\$87,945	\$87,945	\$87,945	\$87,945	\$87,945	\$87,945	\$87,945	\$87,945	\$87,945
Annual Costs for Cages & Racks:	\$290,293	\$188,201	\$188,201	\$188,201	\$188,201	\$188,201	\$188,201	\$188,201	\$188,201	\$188,201
Cumulative Annual Costs for Cages & Racks:	\$290,293	\$478,495	\$666,696	\$854,898	\$1,043,099	\$1,231,301	\$1,419,502	\$1,607,703	\$1,795,905	\$1,984,106

TOTAL COST	\$1,984,106
TOTAL SAVINGS	\$714,025

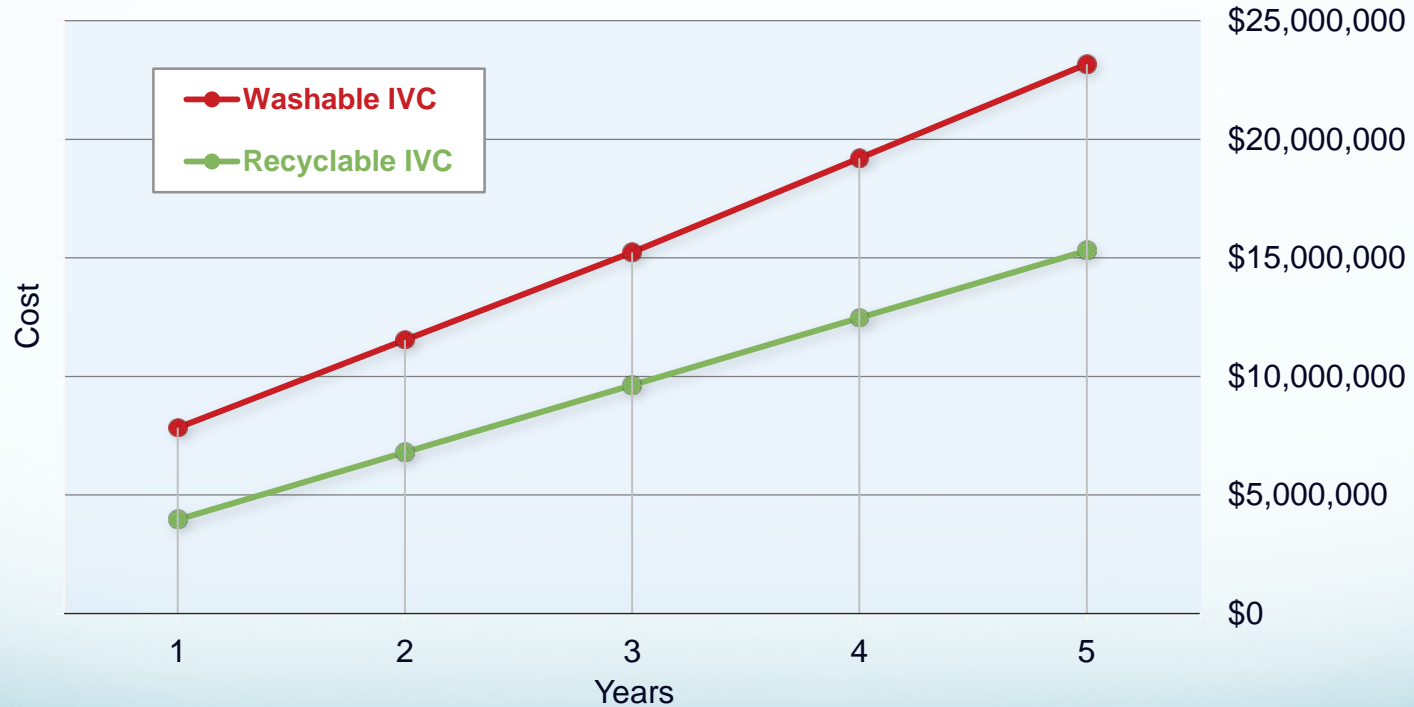
1,000 Cages Including Equipment & Washroom Costs



10,000 Cages Including Equipment & Washroom Costs

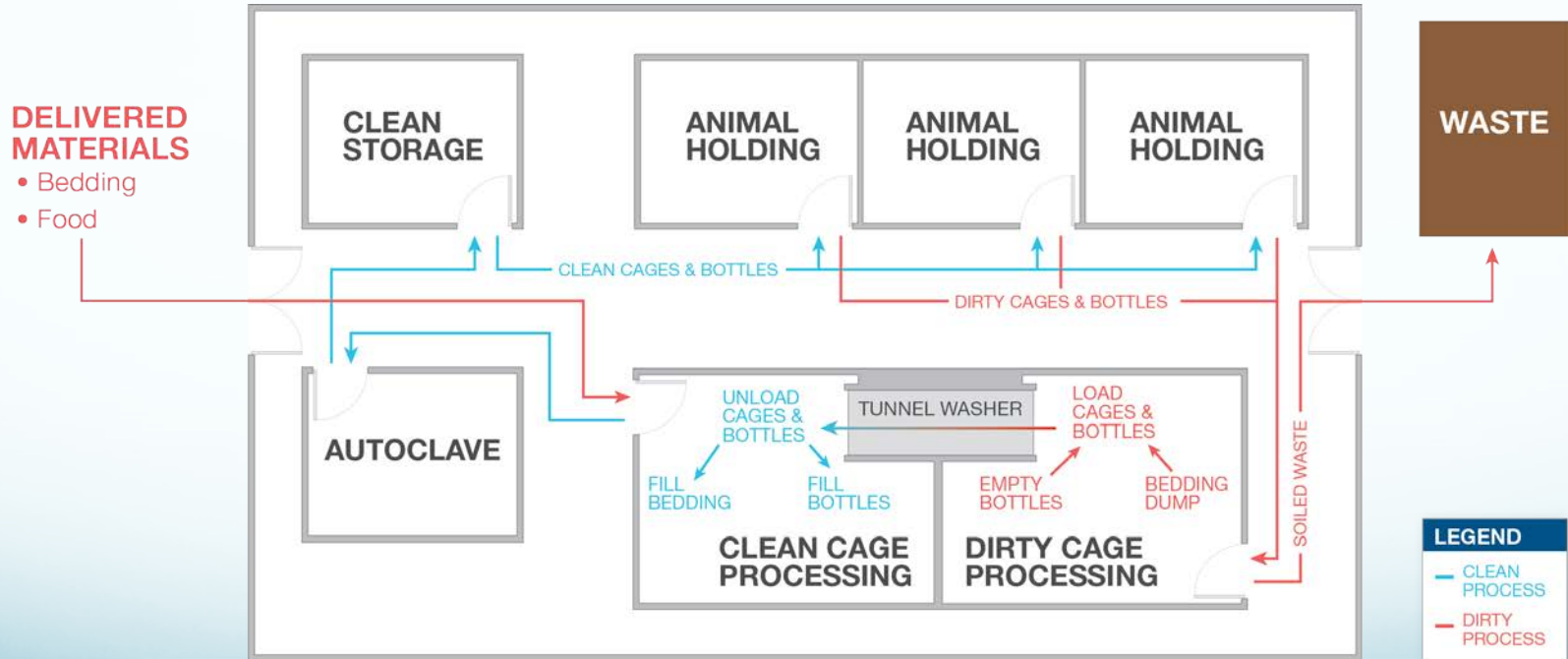


27,000 Static Cages Including Equipment & Washroom Costs



What about process flow,
biosecurity and sustainability?

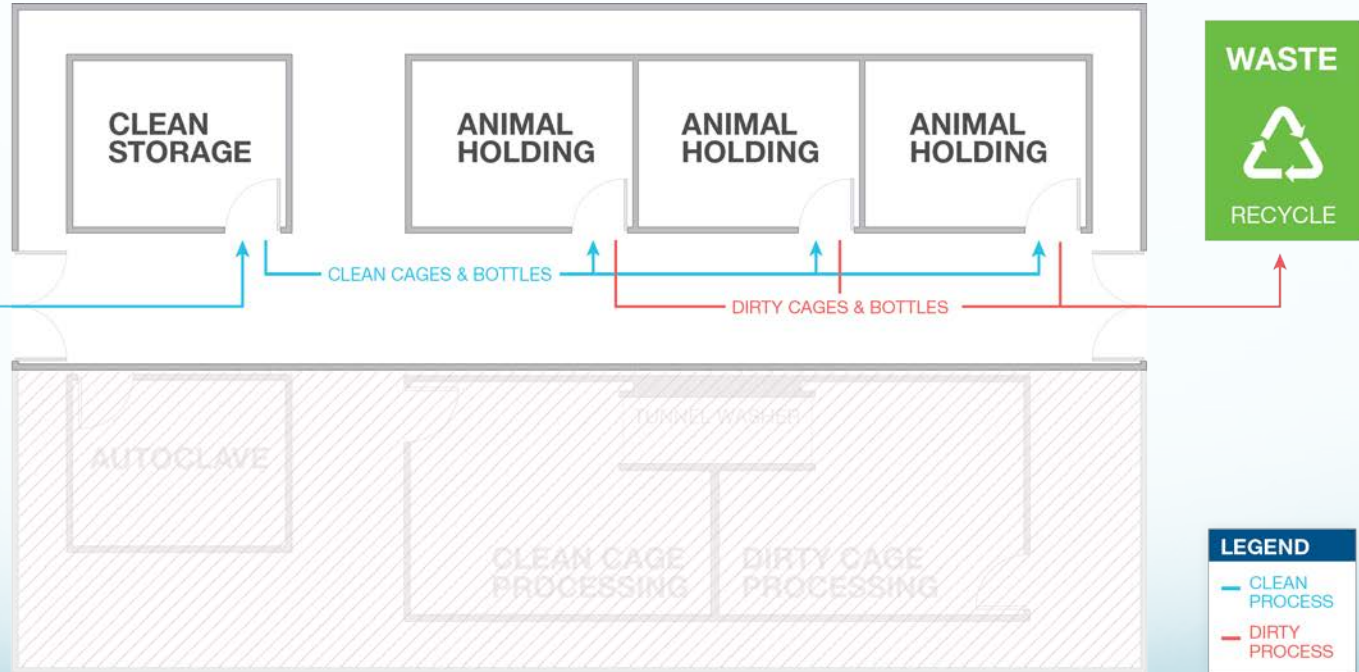
Washable Caging Process Flow



Recyclable Caging Simplifies Process Flow

DELIVERED MATERIALS

- Prebedded Cages
- Prefilled Water
- Food



Sustainability

- In many locations, soiled cages are re-bagged, cages are recycled and bedding is composted.
- In other locations, bedding is separated at the facility and cages are recycled through local recycling.
- Running a vivarium without a cage washing/sterilizing cycle reduces the facility's energy use, water consumption, and detergent cost.
- Recyclable Caging System yields lower HVAC load compared to high HVAC load needed to offset heat generated by a washroom.

Conclusion

- Recyclable caging is a successful technology that has been adopted worldwide by facilities of all sizes.
- To make informed decisions, facilities should know total cost of space, equipment, labor, and operations—not just labor and supplies.
- Annual operating costs for recyclable and washable caging systems are similar, but capital equipment costs for washables make them the more costly alternative.