

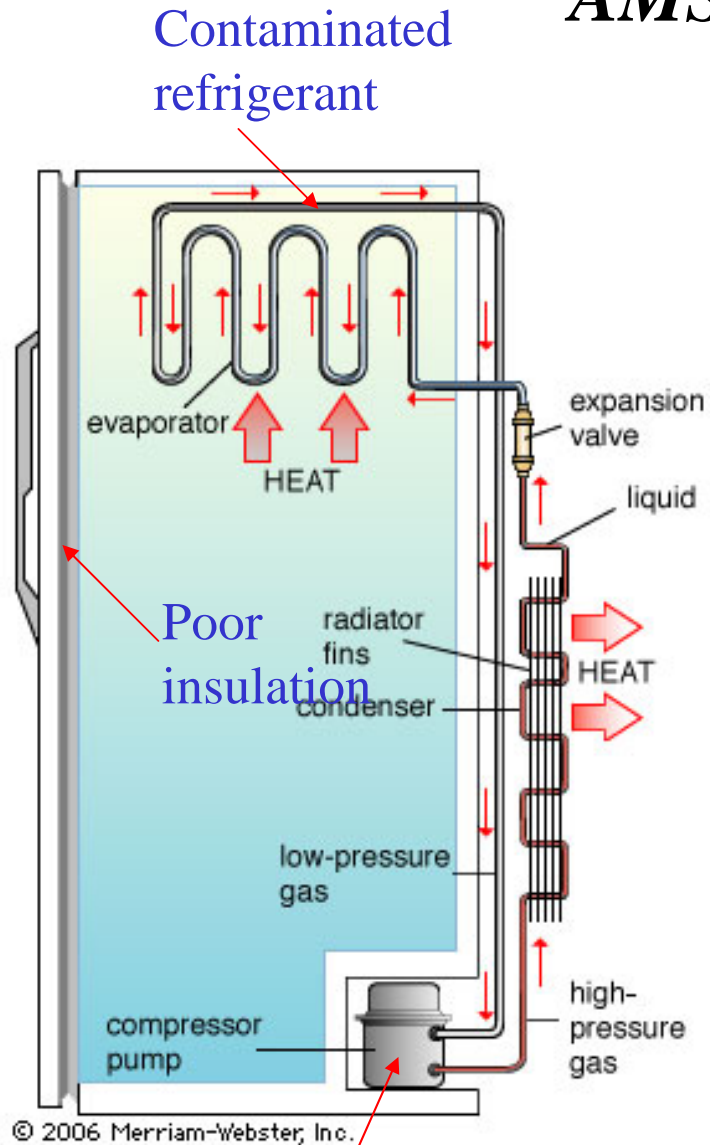
# *III.X Energy Efficiency and HFC-134a Recovery in Residential Refrigerators*



## **Applicability**

- **Demand side activities (end users but not for manufacture)**
- **Replacement** of functional units (with **efficient** units ; refrigerant has **no ODP**, **GWP is <15**).
- **Baseline**-Continued use of inefficient refrigerators (units are **repaired or replaced** with **inefficient** units)
- **Service/supply** by **informal sector**
- **Pre installation survey** of end users and validation of the **prevailing practice of refrigerator repair**

# AMS III.X Baseline



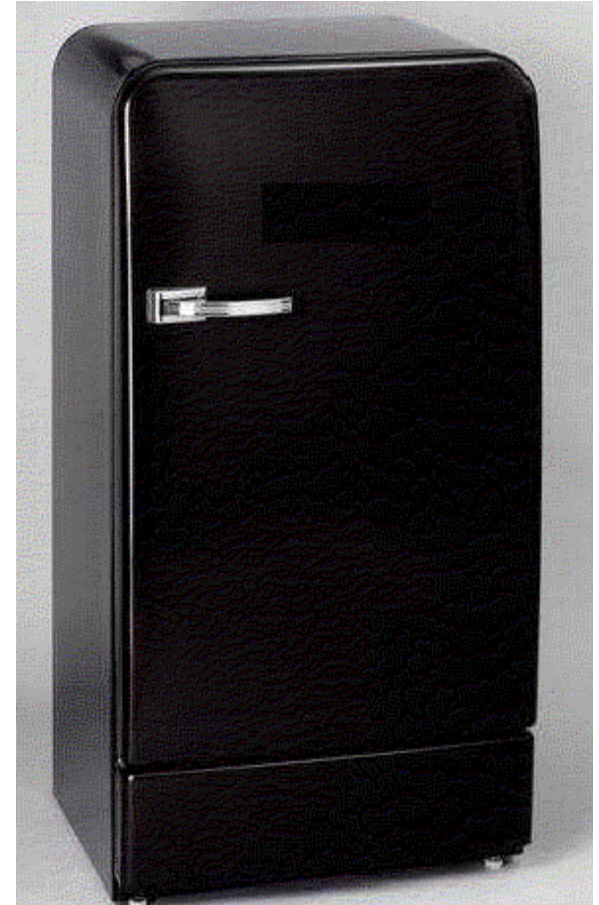
- Supply/Service by cottage industry i.e. informal sector service shops(not a service centre/ franchisee/dealer of a refrigerator company)
- Low quality service practices
  - Reconditioned compressors
  - Flushing with refrigerants (no liquid nitrogen)
  - Evacuation using compressors ( no vacuum pump)
  - Refrigerant charging (trial and error)
- Results in increased direct emissions of CFC-12 (GWP = 4680) or HFC 134a (GWP = 1430)
- And increased electricity consumption

Inefficient  
compressor



# *AMS III.X - Project*

- Baseline refrigerators replaced with **efficient units at no or low cost** to the end user (isobutene, GWP=4.0 as a refrigerant and cyclopentane GWP =3.14 as a blowing agent);
- Baseline units collected back to recycling centre where:
  - Representative sample units tested for annual electricity consumption using same testing standard (e.g., ISO 15502) used for annual nameplate energy consumption of the project refrigerators
  - Sampling to 90% confidence interval +/-10% error
  - Refrigerators are disassembled and materials recycled
  - refrigerants and foam blowing agents in refrigerator insulation material (CFC-11, CFC-12 and HFC-134a) are recovered, reclaimed and/or destroyed
  - As per WEEE standard or a national standard



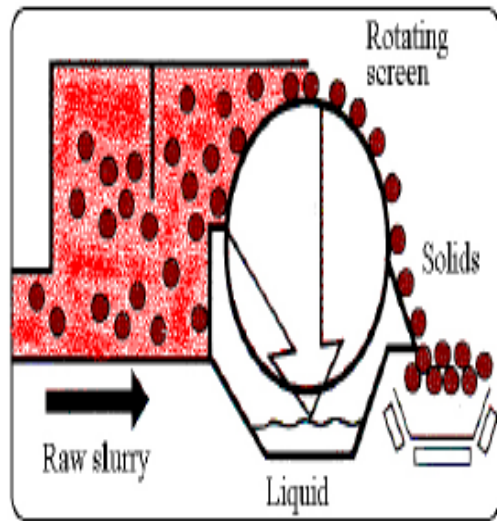
## *AMS III.X-HFC 134a baseline*

- HFC-134a recovered using equipment tested as per ISO 11650 or equivalent national or international standard.
- Only **reclaimed** qty of refrigerant considered for conservative estimation (actual refrigerant loss could be higher, > 3 times initial charge)
  - **Reclaim**: reprocess used refrigerant by distillation, to virgin product specifications, removes contaminants such as water, chloride, acidity, high boiling residue, particulates/solids, non-condensables, and impurities including other refrigerants. Chemical analysis required to determine that appropriate specifications are met, typically occurs at a reprocessing or manufacturing facility
  - **Recycle**: clean using oil separation and single or multiple passes filter-driers, to reduce moisture, acidity, and particulate matter, normally in field sites.
- Cross check by number of refrigerators and refrigerant oil recovered

## *AMS III.X- Monitoring*

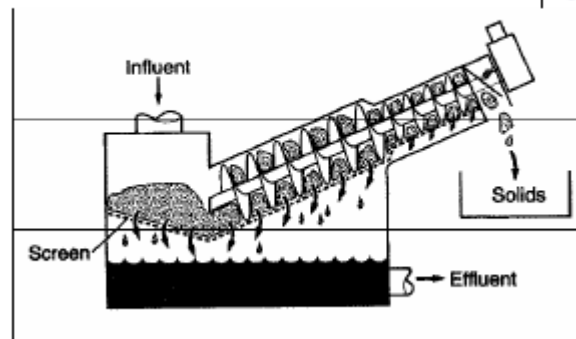
- Specifications of refrigerators distributed and collected back
- annual survey of a statistically valid representative sample of recipients to determine the number refrigerators operating
- Weight of reclaimed HFC 134a:
- samples of HFC-134a analysed with gas chromatography, acidity titration and water coulometric titration according to ARI Standard 700 of 2006 “Standard for Specifications for Fluorocarbon Refrigerants” or other comparable national or international standard that meets or exceeds these requirements shall be employed.

# AMS III.Y Methane avoidance through separation of solids from wastewater or manure treatment systems



Solid/Liquid Separators	Total Solids Capture Efficiency
Static Inclined Screen	10-20%
Inclined Screen with Drag Chain	10-30%
Vibratory Screen	15-30%
Rotating Screen	20-40%
Centrifuge	20-45%
Screw or Roller Press	30-50%

## Screw Press Separators



- Mechanical and thermal technologies
- Reduced volatile solids = Reduced emissions
- Co benefits: Ease of handling and transport, Odor reduction, Reduced threat to water quality

### III.Y Methane avoidance through separation of solids from wastewater or manure treatment systems

- Solid separation technology must achieve 20% solids content of the separated solids;
- Mechanical solid/liquid separation technologies are operated in-line with the inflowing effluent;
- For thermal treatment technologies (evaporation and spray drying technologies) any condensate should have negligible COD load;
- Dry matter content of separated solids shall remain higher than 20% throughout until its final disposal, destruction or use (e.g. spreading on the soil);
- Separation of solids using gravity (settler tanks, ponds, or geotextile containers/bags) is not included in this methodology;
- Liquid fraction from solid separation system treated either in the baseline treatment facility or in a treatment system with a lower methane conversion factor (MCF) than the baseline system

### III.Y Methane avoidance through separation of solids from wastewater or manure treatment systems

- Baseline (anaerobic manure management system): Methane conversion factor as per 2006 IPCC Guidelines, Volume 4, Chapter 10 as in approved methodology AMS III.D.
- Baseline (wastewater treatment system): calculated based on the COD removal efficiency of the solids separation device as per 2006 IPCC Guidelines, Chapter 6 of volume 5 as in approved methodology AMS III.H.
- Project emissions on account of any storage of solids, use of fossil fuel/electricity for the separation process are included
- Broad set of options for final treatment of separated solids: bricketting and combustion, composted or spread on soil, combusted directly

# Revision of AMS III.K. Avoidance of methane release from charcoal production by shifting from traditional open ended methods to mechanized charcoaling process

