Understanding and Mitigating the Impacts of Illegal CFC-11 Use in the Production of Polyurethane Foams

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• EIA CFC-11 Investigation
• Estimate of CFC-11 emissions and bank from illegal CFC-11 use
• Key areas of uncertainty
• CFC Seizures
• Trade in ODS-containing formulated polyols
• Drivers of illegal CFC-11 use
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• Independent charity founded in 1984 that investigates and campaigns against environmental crime and abuse.

• Four programme areas: Climate, Forests, Oceans, Wildlife

• Almost three decades of experience working with international bodies, governments, enforcement agencies and industry to tackle illegal trade in refrigerants.
EIA Investigation

• EIA contacted 25 companies in the PU foam production business
• 18 companies (17 rigid foam/raw material producers and one blowing agent seller) in 10 provinces confirmed use of CFC-11
• Four onsite visits to PU foam factories in Hebei – 3 claimed CFC-11 was used in over 90% of their products, one stated 70-80%.
• Primarily used in construction especially cold storage
• CFC-11 widely produced by small underground factories in Hebei, Shandong and Inner Mongolia
• Four flexible foam producers denied using CFC-11
Location of Enterprises Confirming CFC-11 Use
Lab Tests

• PU foam samples from three companies:
  • Dacheng Aoyang Chemical Co. Ltd.
  • Dacheng Shengshi Tianchuang Chemical Co., Ltd.
  • Dacheng Desheng Chemical Co., Ltd.

• Independent laboratory testing using mass spectrometry analysis confirmed presence of CFC-11 blowing agent in all three samples

• HCFC-141b and HFC-245fa were not detected in the samples
Dacheng Aoyang Chemical Co. Ltd

- Stated CFC-11 is used in 90% of their production (capacity of 100 tonnes/day)
- R11 factories shady, hidden operations in Inner Mongolia, regularly change location
- Claimed to have 100s of tonnes of CFC-11 stockpiled
- Exporting CFC-11 in polyols avoids customs control
Dacheng Shengshi Tianchuang Chemical Co. Ltd.

• Claimed to produce CFC-11 themselves in factory based in Inner Mongolia
• Have exported through a trader to North Korea and Mongolia
• Stated 100% of their white agent production is using CFC-11
Dacheng Desheng Chemical Co., Ltd.

- Claimed to be by far the largest supplier of formulated polyol in the region
- Use CFC-11 in up to 95% of their production
- “F-11 is cost effective.”
Government & Independent Corroboration

• New York Times investigation (25 June 2018) identified CFC-11 use in foam insulation in buildings & refrigerators

• 2016: Shandong environment official report – “currently there is still a large volume of illegally produced CFC-11 being used in the foam industry”.

• 2017 presentation by refrigeration expert: “Currently the most frequent usage of ODS in cold chain industry is CFC-11 as PU foam blowing agent for cold storage and pipe insulation.”

• China Enforcement Actions
  • 2010 to 1st half of 2018 - 14 cases involving illegal production of CFC-11, 84 T of illegal CFC-11 destroyed and production facilities dismantled, fines imposed on four enterprises for illegal CFC-11 use
  • Since EIA’s report, 1172 related enterprises were inspected, CFC-11 identified in some batches of material in 10 PU pre-blended polyol enterprises. Local EPBs filing charges.
  • August 2018: two illegal CFC-11 production sites in Liaoning and Henan province. 177.6 tonnes of raw materials and 29.9 tonnes of CFC-11 confiscated.
Estimate of CFC-11 Emissions & Bank – Basis of Calculation

1. Widespread (70%) use of CFC-11 in China’s PU rigid foam production

2. Size of China’s rigid PU foam market 1.7MT in 2012 incr to 2.7 MT in 2015 (incr 8.2% CAGR 2016 onwards)

3. Spray foam is 11% of the rigid PU foam market

4. Emissions on production of the foam - 25% for spray foam and 5% for other rigid PU foams

5. CFC-11 comprises 10% of the finished foam by weight
EIA Estimate: Potential CFC-11 Emissions & Bank

- 2014-2016 average annual CFC-11 emissions of 12,972 tonnes
- 2013-2017 average annual new bank of CFC-11 in foams of 166,000 tonnes

Bank 2013-17 almost 4GtCO₂e of CFC-11
Key Areas of Uncertainty

1. Emissions from the CFC-11 bank – pre-illegal use and post (did illegal use occur before the phase-out of CFCs)?
2. Size and format of China’s PU foam sector
3. Proportion of China’s PU foam sector using CFC-11
4. Proportion of CFC-11 in polyol formulation
5. Emissions from foam blowing operations
6. Other sources of CFC-11 emissions – e.g. during CFC-11 production, use in other foams (e.g. one-component foams), use in other sectors, byproduct?
7. What about the CFC-12?
CFC Seizures

- Seizures of CFCs reported in Russia, Uzbekistan, Turkmenistan, the Netherlands
- Other relatively large CFC-12 seizures known to have taken place in Southern Africa, central and south-east Asia in 2018.
- Questions over scale of demand for & trade in CFC-12 and other banned ODS cannot be answered without timely sharing of information.
Trade in formulated polyols

- Clear potential for export of CFC-11 containing pre-blended polyols;
- Impossible to assess international trade in fully formulated polyols containing ODS or HFCs;
- Multiple HS codes, no mandatory reporting, not included in licensing;
- Potential for significant circumvention of ODS phase-out and HFC phase-down.
Drivers of Illegal CFC-11 Use

• $$$ – CFC-11 is cheaper and more productive
• Superior foam blowing agent – better product
• Significant growth of demand for PU foam from the cold food chain and construction generally
• HCFC phase-out – concerns expressed as early as 2010 about new blowing agents
• Low price of the isocyanate, encouraging new companies to set up rather than purchase expensive formulations from US/Europe
• Building codes from 2013 requiring insulation in new buildings to improve efficiency
• Easy to make, doesn’t require much space, can be disguised in existing factories
• Ease at which it is hidden once in the polyol formulation (export)
• Lack of enforcement, penalties, awareness
Recommendations

• Address data gaps and uncertainties
• Carry out targeted market surveillance, testing foam products and pre-blended polyols, including at foam production facilities, construction sites, in buildings (including cold storage) and products (e.g. solar panels)
• Devise testing procedures for CFCs in polyol formulations
• Ensure regular customs checks of pre-blended polyols
• Apply strict penalties for illegal production and use and publicise enforcement efforts
• Require monitoring & reporting of ODS-containing pre-blended polyols (including in licensing systems)
• Investigate & report on all cases of ODS illegal trade to Ozone Secretariat
• Maintain and enhance the science – ensure a robust and transparent atmospheric monitoring system
For more information:
https://eia-global.org/illegal-cfc-production-use/

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