

Compliance and Testing: A Global Overview

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How Cadillac Cheated on Emissions Control

- Computer programmed to recognize emission test conditions
- Outside of test conditions, computer switched off emission control device
- Actual emissions were worse than lab test



**EPA fined
Cadillac \$40M!**

A Few Years Later...

- EPA changed rules so that it was harder to circumvent the test
- The manufacturers of diesel engines (for trucks) repeated Cadillac's strategy to illegally reduce tested emissions
- EPA discovered the violation

EPA fined the diesel manufacturers

\$1 Billion!

In Contrast, For Smaller Appliances...

- Governments almost never
 - independently verify manufacturers' claimed energy use
 - Penalize manufacturers for false claims or circumvention
 - Confirm that tested values conform to use under actual conditions
- Governments typically enforce by
 - Receiving information on violations from other manufacturers or consumer groups
 - Informal discussions with manufacturers with private settlements

Focus on Refrigerators

- Test vs Field
- Manufacturers' declared values
- Displaying energy labels

Tests Need to Be Updated and Verified in Field

- New technologies & features
 - Insulations, compressors, controls, software
 - Ice making, Displays, Network access, Food monitoring & sensing
- New operating conditions
 - Ambient temperatures, door openings, mix of foods
- Higher efficiency
 - Greater sensitivity to ambient temperature, users
 - Software has greater influence on performance
- *Most tests measure performance of appliance's hardware but not software*

Label vs Field Energy Use

- Question: How reliable is the label?
- Answer with anecdotal data
==>
- Is difference a result of test?
Behavior?
Technology?
- ==> need more detailed studies

QuickTime™ and a decompressor are needed to see this picture.

Energy & Climate Policy Implications

- Energy test values are increasingly used for assessing progress in energy savings
 - CO₂ emissions reductions
 - Utility efficiency programmes earn profits based on savings
 - Test procedures are used as a proxy for field measurements -- DANGEROUS!

Energy Efficiency of Refrigerators in Japan

QuickTime™ and a
decompressor
are needed to see this picture.

Japan: Label vs Field (2004)

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decompressor
are needed to see this picture.

Source: Tsurusaki et al. 2006

Many Aspects of Compliance

- Do manufacturers report the true energy use?
Manufacturers can (and have):
 - Designed appliance to circumvent test
 - Cars
 - Refrigerators
 - Air conditioners
 - Washing machines
 - Exploited ambiguities in test conditions (see numerator effect)
 - Exploited tolerances when declaring an appliance's energy consumption from tests
 - Refrigerators in Europe
 - Tyres (soon)

The Numerator Effect: Measuring Energy Use is Only Half of the Issue:

- Most MEPS are expressed in terms of an “efficiency”

$$\text{Efficiency} = \frac{\text{Service}}{\text{Energy Use}}$$

- Many manufacturers exaggerate their products’ volume, area, flow, or size
 - Actual “efficiency” is lower than stated, possibly not even complying with MEPS

More Aspects of Compliance

- Toprunner & CAFE: is fleet average correct?
 - Impossible for 3rd party to verify compliance of a single unit
- What is a “new” product?
 - Reconditioned motors and copiers
- In the marketplace
 - Failure to display energy label
 - Fraudulent labels

Who Pays for Verification & Compliance?

- Ultimately, the consumer pays the costs for inadequate verification & compliance
 - Higher energy costs, reduced services
- Modest up-front expenditures by government and industry lead to substantially lower consumer costs
 - Maintaining technical integrity of test procedures and efficiency regulations
 - Policing manufacturers' claims
 - Important during periods of changing technology
 - Verification & compliance can be cost-effective
- Manufacturers of *compliant* products suffer

Conclusions

- *Creating* a MEPS/label is only the first step
 - Need to establish mechanisms for compliance and verification to create
 - Maintaining the credibility of the programme benefits consumers and industry
- Compliance and verification have both technical and regulatory components