Impact of Environmental Factors on Energy Efficiency of Room Air Conditioners in India

Energy Evaluation Asia Pacific 2019
Bangkok
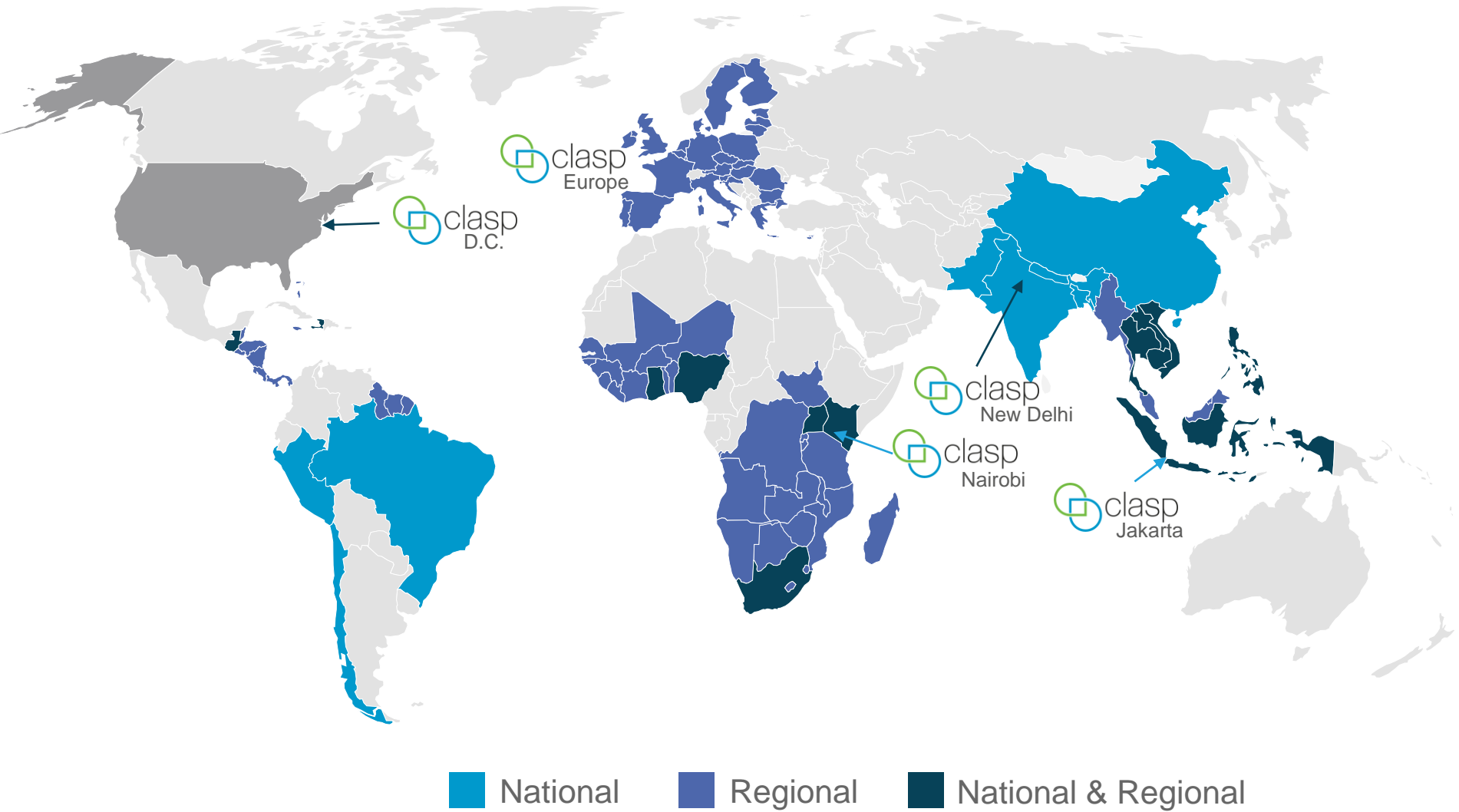
Neha Dhingra
30th October 2019

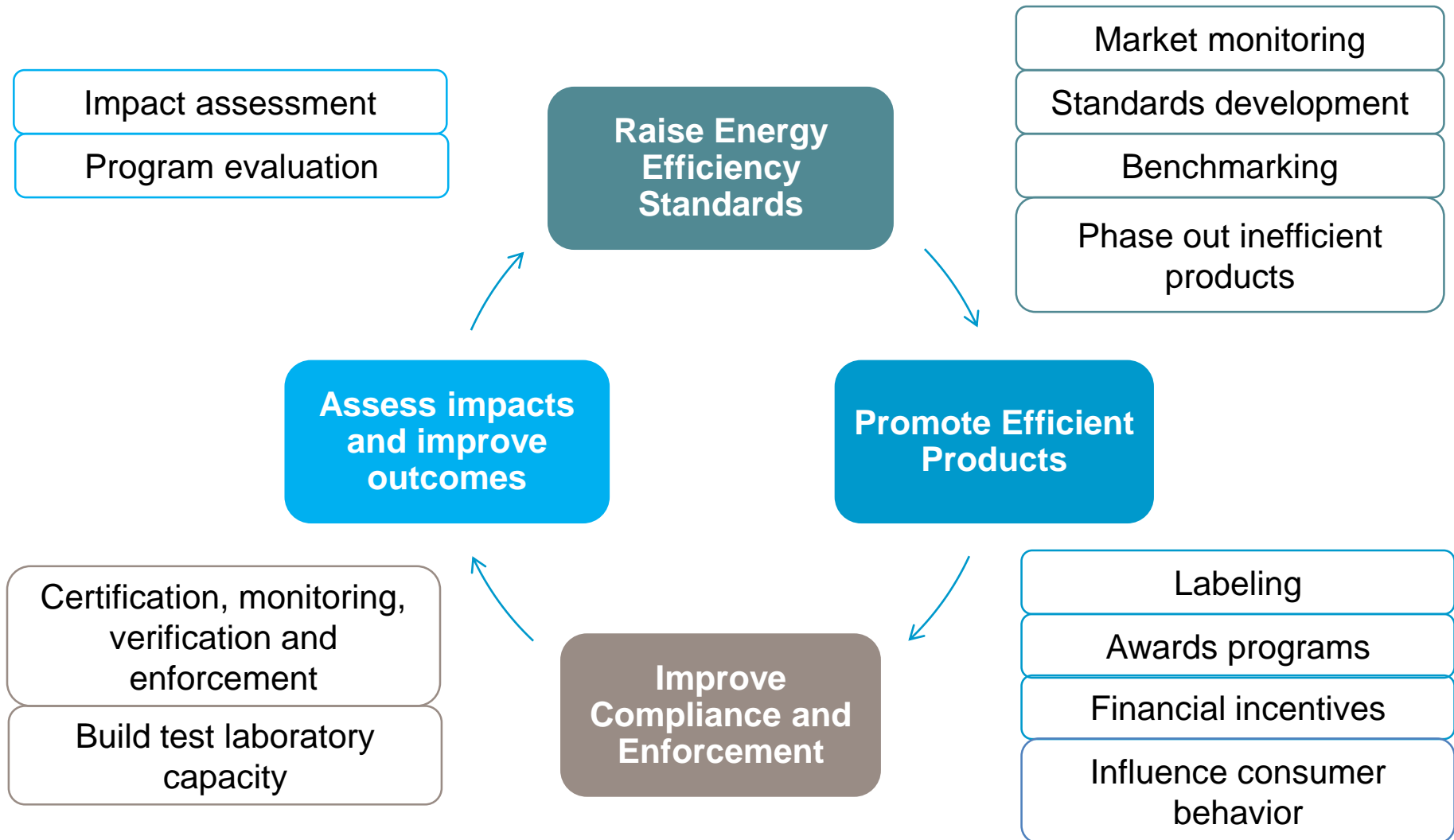# Accelerating our transition to a more sustainable world

Mission to improve the energy and environmental performance of appliances and equipment we use every day, accelerating our transition to a more sustainable world

Where We Work

National
Regional
National & Regional

clasp Europe
clasp D.C.
clasp New Delhi
clasp Nairobi
clasp Jakarta

3

A holistic approach to appliance energy efficiency programs

Impact assessment

Program evaluation

Raise Energy Efficiency Standards

Market monitoring

Standards development

Benchmarking

Phase out inefficient products

Assess impacts and improve outcomes

Promote Efficient Products

Certification, monitoring, verification and enforcement

Build test laboratory capacity

Improve Compliance and Enforcement

Labeling

Awards programs

Financial incentives

Influence consumer behavior

Introduction

- RACs contributed 30-40% of cooling energy consumption in 2017-18

- Annual RAC sales have increased rapidly to 7.6 million in 2017 resulting in energy consumption

- India launched labeling program for RACs in 2006

- Products are tested under standard testing conditions in test labs to participate in the program

- In real life conditions, ACs are exposed to adverse climatic conditions

- To assess the impact of environmental factors on the efficiency of RACs, expose the products to climatic conditions

- Scope- Unducted single split/window AC units including fixed and variable capacity

Approach and Methodology

•Identify national/international test standard for environmental and energy performance testing

•Identify a nationally accredited test lab for testing

•Prepare sampling plan comprising of major brands, categories, types, capacities and heat exchangers

•Following a stepwise approach for testing:

Establish baseline efficiency

Subject samples to environmental conditions (such as corrosive, dusty and saline)

Conduct performance tests again and assess change from baseline

Environment and Efficiency Test Standards

Environmental Tests

- IS 9000 part XII for dust test

- IS 9000 part XI as per procedure 3 for salt mist test

- IS 9000 part VI (10 cycles) Composite temperature/humidity cyclic test

Efficiency Tests

- IS 1391 part 1 for unitary ACs

- IS 1391 part 2 for split ACs

Sampling plan

| Type of test	Type of AC	Heat Exchanger	No of units
Dust test	Window	Copper	2
	Split (fixed speed)	Copper	2
	Split (Variable speed)	Aluminum	2
Salt mist test	Window	Copper	2
	Split (fixed speed)	Copper	2
	Split (Variable speed)	Aluminum	2
Composite temperature/humidity cycle test	Window	Copper	2
	Split (fixed speed)	Copper	2
		Aluminum	2
Total Number of Samples			18

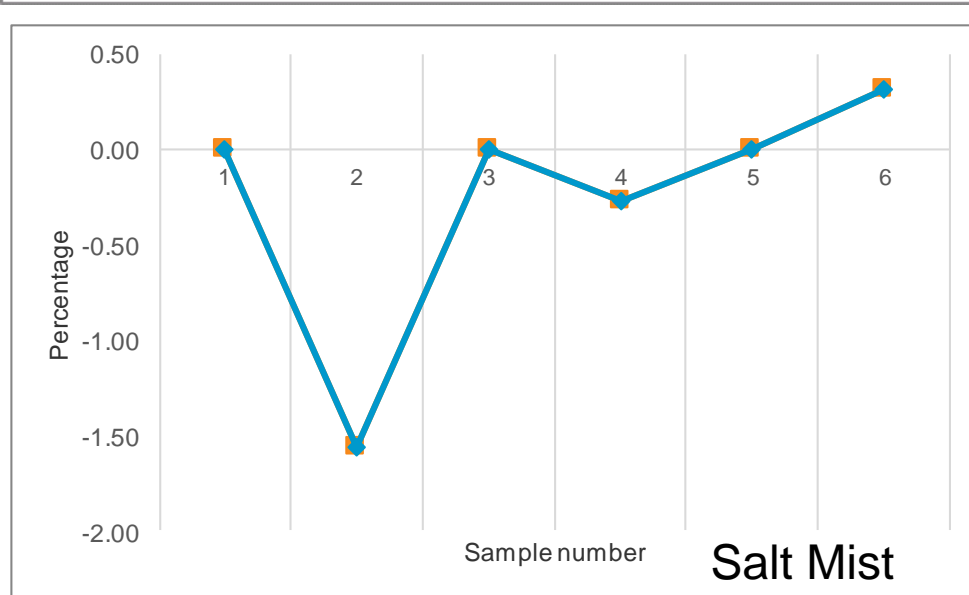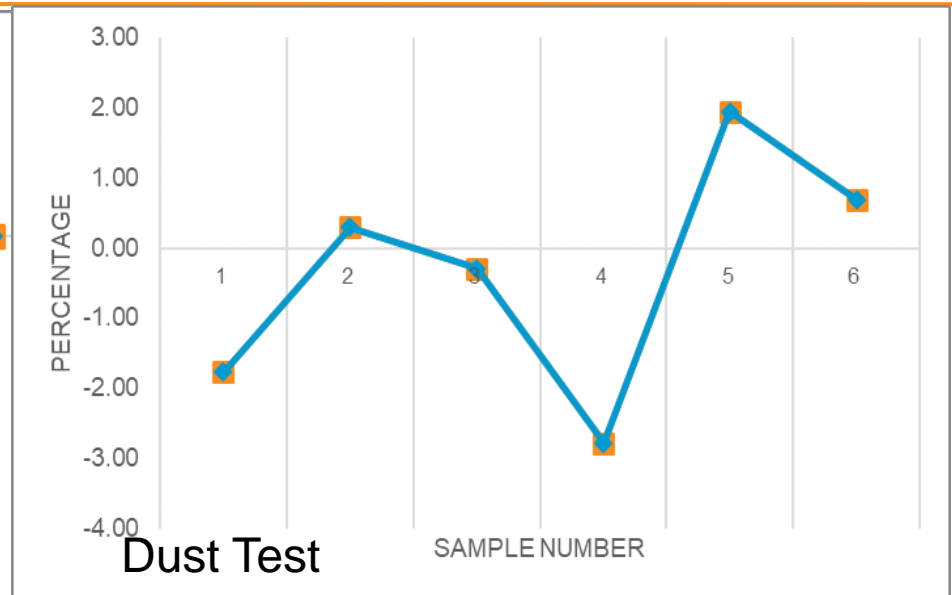# Efficiency Variation Based on Heat exchanger
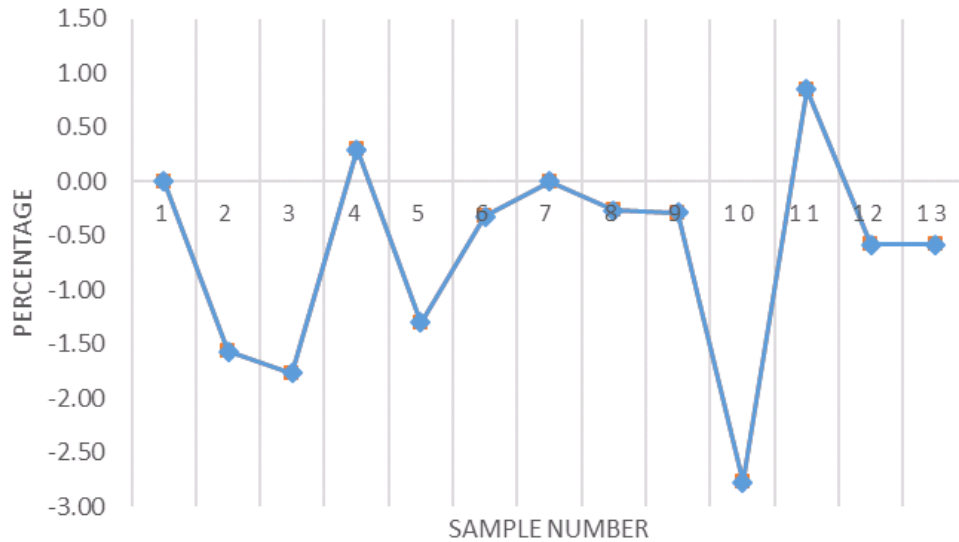
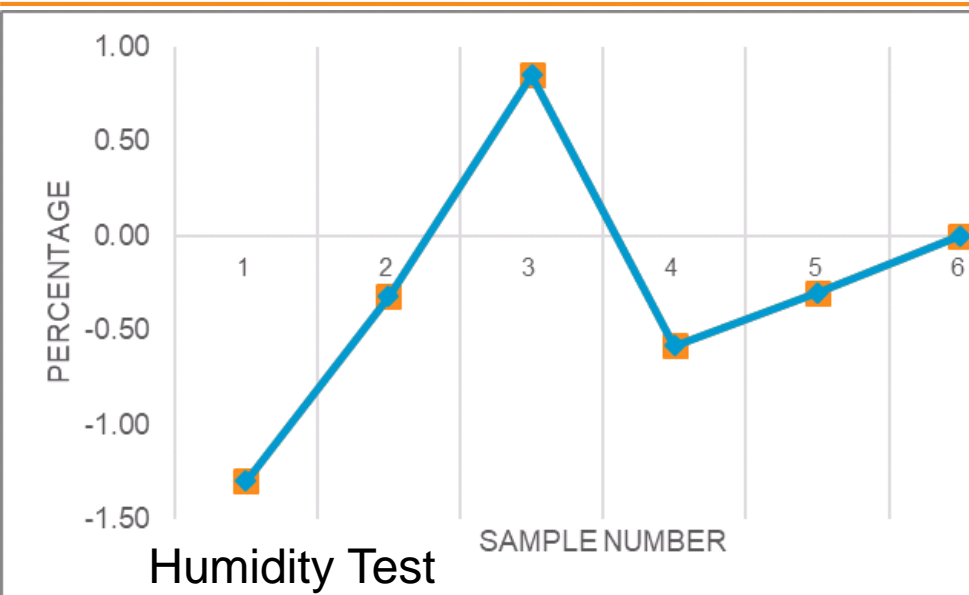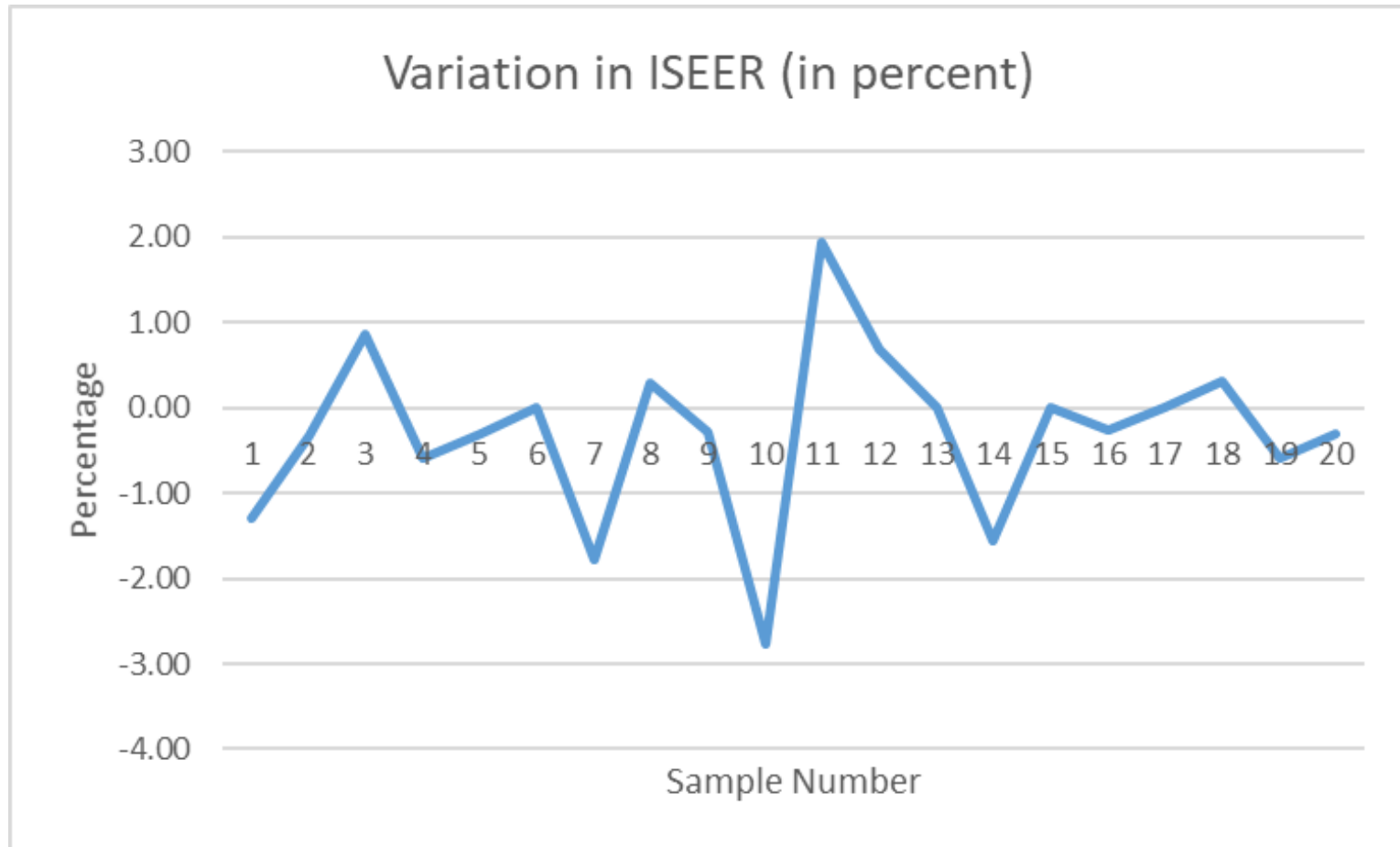ISEER variation for copper heat exchanger

ISEER variation for aluminium heat exchanger
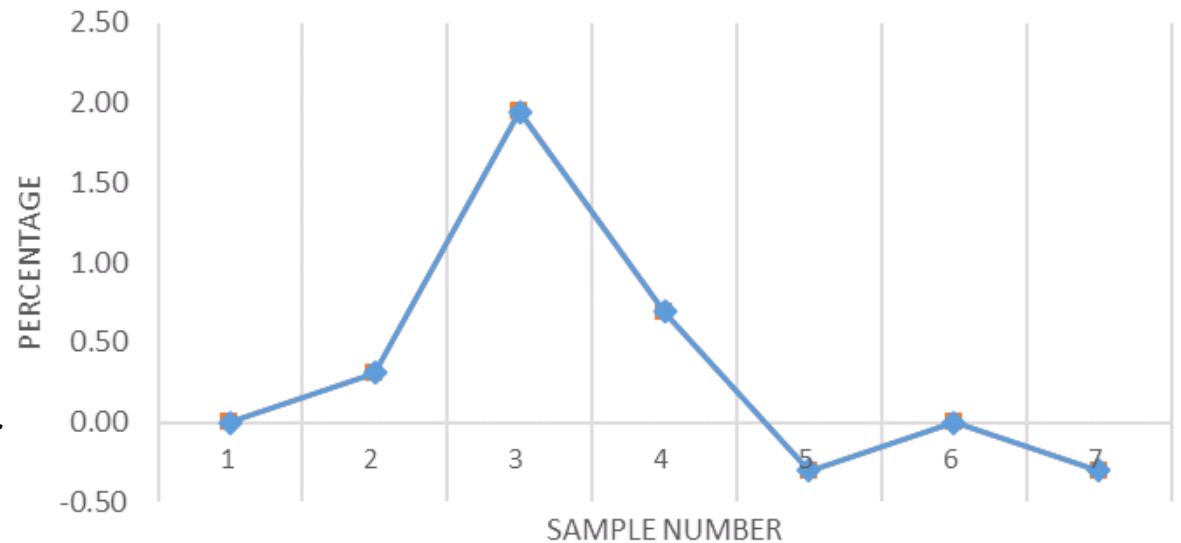
Efficiency Variation Based on Environmental Factors

Humidity Test

Dust Test

Salt Mist

All environmental tests
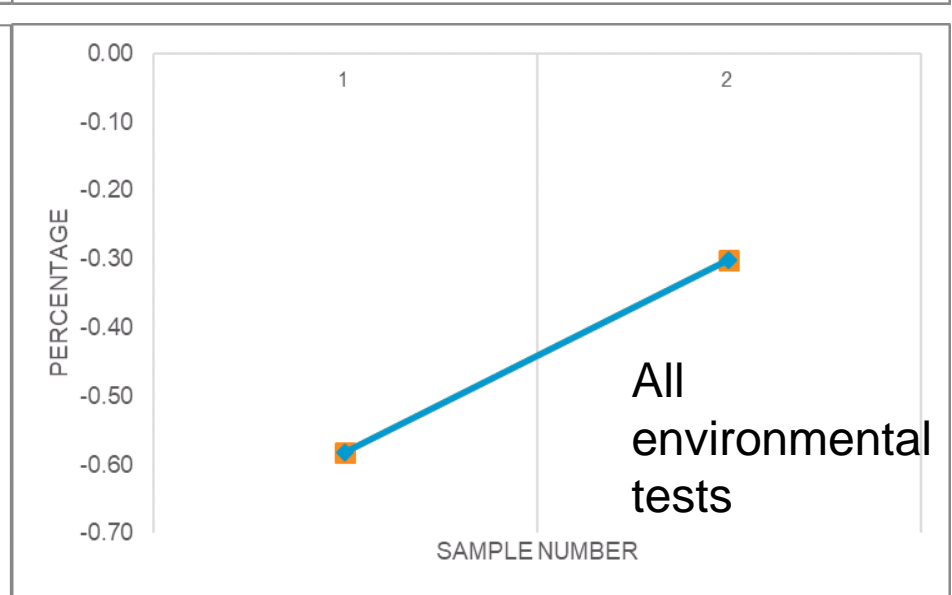
Overall Efficiency Variation

Variation in ISEER (in percent)

Test Results Analysis

- Reduced cooling capacity ranged from -3.79% to 0.57%, with an average of -1.28%.

- Reduced power ranged from -5.03% to 0.76%, with an average of 0.98%.

- Reduced ISEER ranged from -2.78% to 1.95%, with an average of -0.30%.

All these variation in the values are insignificant and within the tolerance limits prescribed in BEE's labeling schedule for all ACs

Conclusions and way forward

- RACs performance in India not affected by short-term exposure to environmental conditions (dust, salt mist, and composite humidity) simulated in the test laboratory irrespective of the
    - type of AC
    - type of heat exchanger
    - type of tests
- Could be due to some quality measures taken by manufacturers safeguarding against environmental factors
- Can be further expanded to expose the samples to salt mist test for a prolonged duration
- Samples from the field across various climatic conditions can be tested to assess the impact on energy performance in real life situation