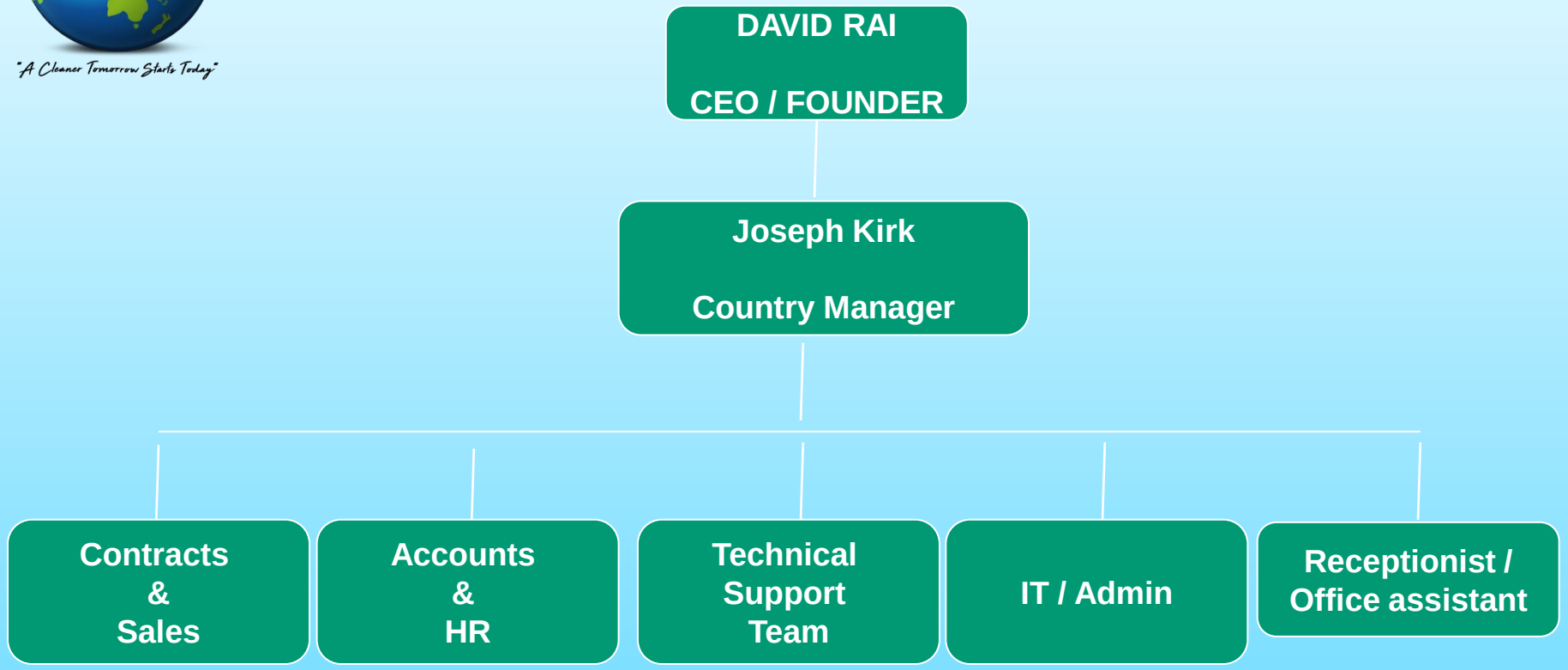
"A Cleaner Tomorrow Starts Today"

INNOVATIVE HYDROGEN ASPIRATION TECHNOLOGY INDIA PVT LTD

IHAT FLOW CHART



"A Cleaner Tomorrow Starts Today"

INNOVATIVE HYDROGEN ASPIRATION TECHNOLOGY INDIA PVT LTD

Quality, Health, Safety and Environment (QHSE)

Our Vision

- Install our technologies worldwide
- Reduce Greenhouse gases
- Reduce Diesel Consumption
- Placing Our Client's Commercial and Environmental needs First

Our Principles

- Placing Health and Safety first worldwide
- Solving the Environmental Issues
- Always being the Best We Can Be

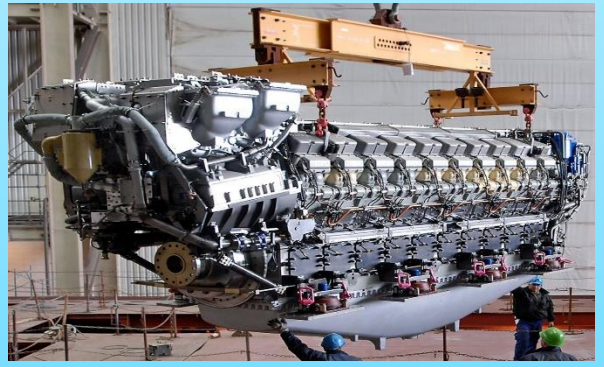
Our Commitment

- Reducing / Eliminating Emission (Black Smoke) exiting from the exhaust (GHG)
- Reducing Fuel consumption by 5%-20% depending on application
- Reducing the impact on Health & the Environment .

INNOVATIVE HYDROGEN ASPIRATION TECHNOLOGY INDIA PVT LTD

"A Cleaner Tomorrow Starts Today"

THE PROBLEM



- Equipment/Vessel/Machinery operating at minimum profit
- Maintenance costs continue to rise as new pollution controls are implemented
- Fuel Prices continue to rise
- We are contributing to the GHG Emissions

The Solution – Hydrogen Injection

i-phi™ helps increase the profitability by:

- *Reducing the fuel consumption*
- *Decreasing maintenance cost*
- *Minimizing emissions*

Effects of Hydrogen injection in combustion

- Enhances combustion characteristics of gaseous or liquid hydrocarbon fuels
- Significantly extends the lean flammability limit of the carbon-based fuel results in:
  - A more complete burn
  - Increased fuel mileage
  - Decreased emissions
- Many independent tests dating back to the 1970s have validated this effect

Concerns with Hydrogen

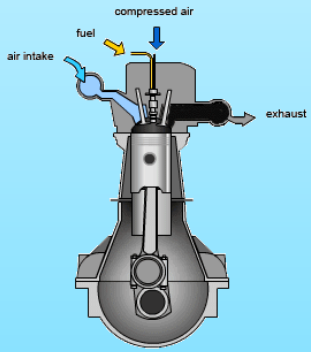
- Dangerous to Carry
- Expensive to Produce
- Costly to Distribute

i–phi™ - Overview

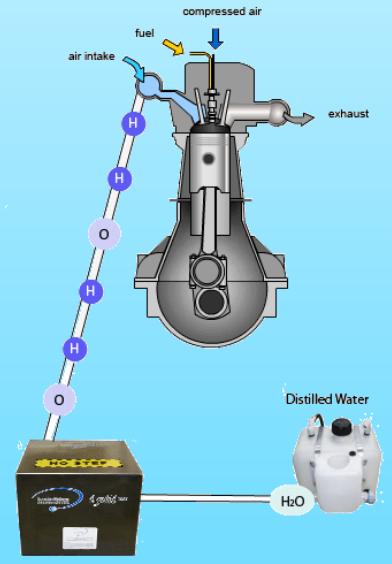
- An aftermarket retrofit device designed to work on **any** internal combustion engine
- Converts distilled water into hydrogen and oxygen gases through electrolysis
- Injection of hydrogen and oxygen into air / fuel mix prior to combustion
- Operates on demand only when the engine is running
- Eliminates the need for on-board hydrogen storage and addresses safety concerns

i–phi™ - How It Works

Diesel Engine



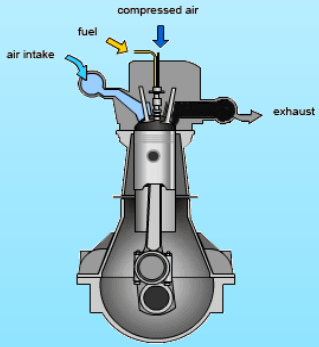
Diesel Engine With IHS *i-phi*



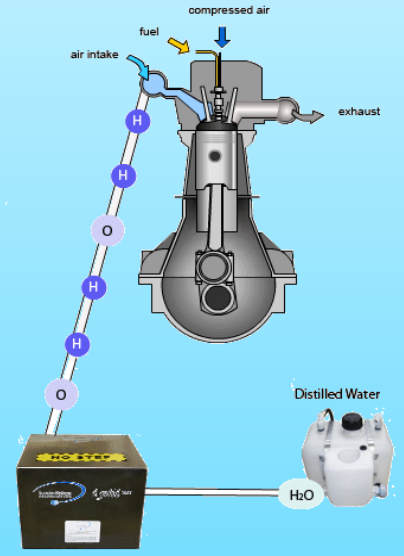
- Adding Hydrogen & Oxygen gasses to the Air intake enhances the combustion Process
- The Hydrogen burns faster than the diesel fuel spreading the flame faster and producing a more complete burn of all the fuel
- Burning More Fuel increases the distance traveled per Liter of Diesel Fuel
- Burning More Fuel increases Engine Power and Torque

i–phi™ - How It Works

Diesel Engine



Diesel Engine With IHS *i-phi*



- Burning More Fuel results in less soot and other pollutants
- Less Soot extends the life of the EGR valve decreasing maintenance costs
- Less Soot reduces the re-gen frequency of the Diesel Particulate Filter saving both time and money
- Hydrogen helps to clean up the carbon deposit buildup in the engine

i-phi™ - Savings

- Minimum 20% more fuel savings after engine purge cycle (usually after 6 months or even earlier in many cases) for Diesel Power Generating Sets. The percentage varies in Natural Gas Generating Sets, BioMass and other applications
- Reduced Emission/Carbon Foot Print
  20% less NO_x, 50% less HC, CO, WCBSFC, and 86% less Particulate Matter

i–phi™ - Competitive Advantage

Increased Reliability

- Minimal heat (No component failure or leaks)
- Less maintenance (No operator intervention)
- Operating and storing between –40°C to +85°C (-40°F to +185°F
- Operating – 5g's peak acceleration, 11 ms pulse width
  Non-operating – 10 g's peak acceleration, 11 ms pulse width

INNOVATIVE HYDROGEN ASPIRATION TECHNOLOGY INDIA PVT LTD

OUR COMMITMENT

- Quantify
- Verify
- Certify

i–phi™ How it is installed

i –phi™ unit is installed on the available space in truck/bus/ferry/stationary power generators etc.

i–phi™ - How it is installed

- **No** modifications are performed to the engine
- Electrical Power to *i –phi*™ is provided through the power generated by generator
- Hydrogen injection tube is connected to the air intake

Safety Features of *i–phi*™

- *i–phi*™ only operates when engine is running as the power is provided to the unit by generator
- *i–phi*™ is equipped with sensors and unit will shut itself off and stop producing Hydrogen in case of an impact/hit or rollover

i–phi™ Warranty

i–phi™ comes with 5 years Limited Manufacturer Warranty

- Some conditions apply

Third Party Test Results

- Patent protected - multiple patent applications / (PCT) filed
- Lab / 3rd party testing (Clean Air Report - the only EPA Verified PEMS in North America)
- University of Auburn's SAE J-1321 Type II Fuel Test completed August 11th 2010
- Manitoba Hydro 2 Year Reliability Test
- Lloyd's Registry Safety Report 2015

Customer Success

Several fleets have made re-orders based on initial trials.

- **IHAT has entered into negotiations with North Americas largest O.E.M. Bus Manufacturer**
- **Searcy Trucking in Winnipeg is just completing their Field Trial units and have been experiencing 12% to 15% mileage increase over their fleet average..**
- **Several Companies beginning Field Trials with Conditional Sales after 6 months of 50 to 150 units totaling over 1000 units in Transportation, Power Generation and Marine Applications.**
- **First Marine unit installed May 2015 with Danish Marine Authority on a Cat 3412 Engine on an Ferry one year Field Trial. Preliminary results exceptional in excess of 15% Fuel Savings and a 25% NOX Reduction.**
- **Aga Khan University in Karachi completed their test and recorded a 20% diesel saving.**

"A Cleaner Tomorrow Starts Today"

INNOVATIVE HYDROGEN ASPIRATION TECHNOLOGY INDIA PVT LTD

TEST REPORT

آغا خان یونیورسٹی
THE AGA KHAN UNIVERSITY

Date: 15-05-2017

Certificate of Performance

i-phi (On Board Hydrogen Generator) Device

The i-phi technology is developed by Innovative Hydrogen Solutions, Canada. Custom configuration, design and installation was performed by MRA Solutions (Pvt.) Limited based in Karachi, Pakistan.

Field trial on our CAT 3406 diesel generator was initiated on 10th December, 2016 and it has been in operation since then after furnishing baseline data.

Observations of the Aga Khan University Hospital team are as following.

I. Diesel fuel savings have been in excess of 20%.
II. The black smoke from exhaust has been eliminated during normal load.
III. The black smoke has been significantly reduced during peak load.
IV. This device has not caused any operational issues such as downtime in the regular operation of the diesel generator and this device performed as per expectations.

On behalf of Aga Khan University Hospital

Stadium Road, P.O. Box 3500, Karachi 74800, Pakistan
Telephone: +92 21 3493 0301, Fax: +92 21 3493 4294 / 3493 2095. Website: www.aku.edu

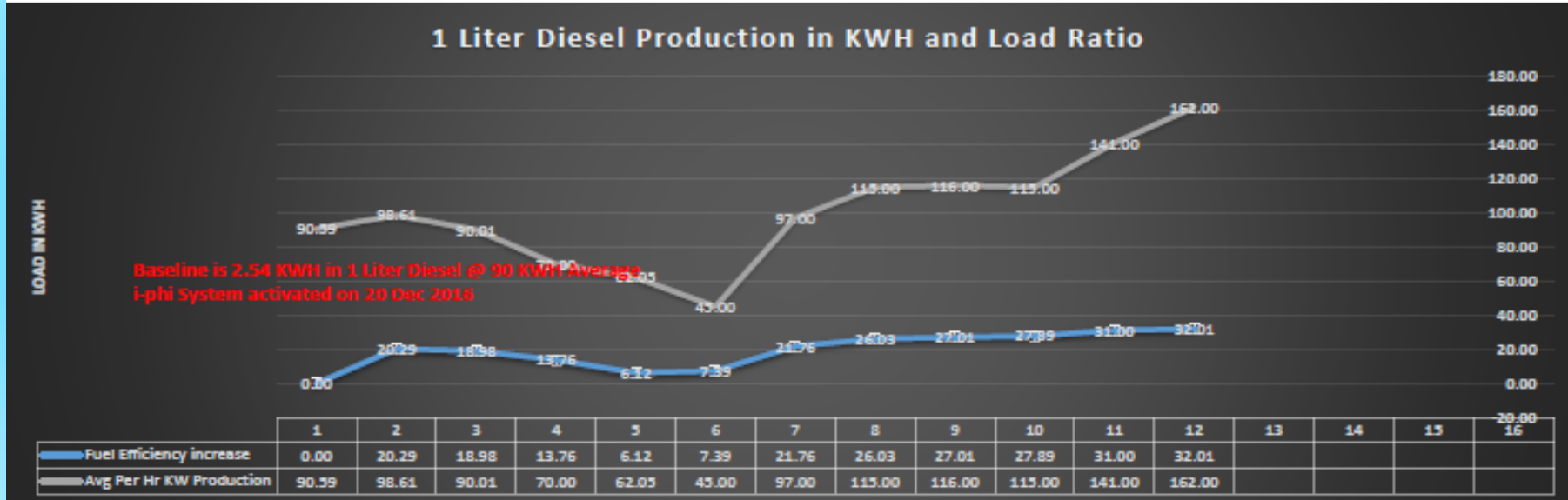
INNOVATIVE HYDROGEN ASPIRATION TECHNOLOGY INDIA PVT LTD

"A Cleaner Tomorrow Starts Today"

MRA SOLUTIONS

AKUH - CAT3406 FUEL PERFORMANCE

Date	Total KWH	Diesel Liter	1 Liter Diesel Prod. KWH	Fuel Efficiency Inc %	Operated Time Hours	Per Hr KW Production Load	Per Hour Diesel Consumption Liter	Operating Capacity 300 KW Capacity
20-Dec-16	5345	2104	2.54	Baseline	59	90.59	35.66	30%
26-Dec-16	4043	1323	3.06	20.29%	41	98.61	32.27	33%
2-Jan-17	5220	1727	3.02	18.98%	58	90.01	29.78	30%
9-Jan-17	4254	1472	2.89	13.76%	56	70.00	26.29	23%
16-Jan-17	3483	1292	2.70	6.12%	56	62.05	23.07	21%
20-Feb-17	4845	1776	2.73	7.39%	70	45.00	25.37	15%
25-Feb-17	5141	1662	3.09	21.76%	53	97.00	31.36	32%
4-Mar-17	7015	2191	3.20	26.03%	61	115.00	35.92	38%
11-Mar-17	7192	2229	3.23	27.01%	62	116.00	35.95	39%
18-Mar-17	6670	2053	3.25	27.89%	58	115.00	35.40	38%
27-Mar-17	7218	2169	3.33	31.00%	51	141.00	42.53	47%
1-Apr-17	8441	2517	3.35	32.01%	52	162.00	48.40	54%



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Fuel Efficiency increase	0.00	20.29	18.98	13.76	6.12	7.39	21.76	26.03	27.01	27.89	31.00	32.01				
Avg Per Hr KW Production	90.59	98.61	90.01	70.00	62.05	45.00	97.00	115.00	116.00	115.00	141.00	162.00				

INNOVATIVE HYDROGEN
IHAT
ASPIRATION TECHNOLOGY
"A Cleaner Tomorrow Starts Today"

Q&A

Q&A

Q&A

Q&A