

**SLICE THROUGH METAL WITH
THE POWER OF NANO**



Indane
NANOCUT

**COST-EFFECTIVE METAL CUTTING SOLUTION
FROM INDIANOIL.**



NANOCUT
HI-THERM INDANE CUTTING GAS



**MESSAGE FROM
DR. SSV RAMAKUMAR, DIRECTOR (R&D), INDIANOIL**

At IndianOil we believe that there is always space for improvement no matter how good a process or product is. It is our search for improvisations that helped IndianOil to introduce a game changer technology: Indane NANOCUT - a high-thermal cutting gas for industrial applications in metal cutting segment. Indane NANOCUT is additized LPG with specific use for metal cutting and related high temperature applications

The breakthrough nanotechnology intervention developed by IndianOil Research and Development Centre, has given a strong boost to the use of LPG in metal cutting segment. For the first time in India, there is a product available that is technically superior with high flame temperature advantage, and is a much safer option within this industry segment.

Customers have certified for the effectiveness and efficiency of the product during extensive field trials conducted by IndianOil. The innovative product has been developed indigenously by IndianOil's Research & Development Centre. The superior performance of the product has been proven through extensive field trials and testing in prestigious laboratories over the last several years. The product ensures faster, cleaner and sharper cuts, with reduced slag and wastage at a thermal temperature that is much higher than the similar products available in the market.

Emitting soot-free and low-glare flame at lower operating pressures, this technically advanced product has low oxygen consumption and heat throughput, and thus is a more environment-friendly option for the end-users and compatible with both automated and manual hand-held torch systems.

Indane is today one of the largest packed-LPG brands in the world. Its reputation is built on the bedrock of trust that Indane has developed with successive generations of users. Its multi-pronged platform of Safety, Convenience and Reliability has been an integral part of the brand's growth and success.

Sd/-

Dr. SSV Ramakumar
Director(R&D), IndianOil



**MESSAGE FROM
MR. GURMEET SINGH, DIRECTOR (MARKETING), INDIANOIL**

At IndianOil, positive change is what dictates progress and development. We realize that without the positive change there is no innovation, creativity, or incentive for improvement. At IndianOil we also initiate change, for better opportunities and to improve customer experiences. Because change is the only constant.

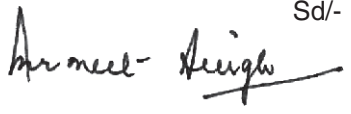
Indane Nanocut is one such product which is born out of an urge to revolutionize customer engagement in the high-therm metal cutting segment. This indigenously developed, patented and awarded technology, has been found to alter and transform high temperature industrial applications.

It has been a long standing requirement of our customers in the Industrial sector for a product that would ease the metal cutting process with economy and comfort in handling. When IndianOil's Research and Development wing produced Indane Nanocut, a technically superior product with high flame temperature, the industry segment welcomed it favorably.

Gauging its immediate acceptance in the Tamil Nadu market and Pondicherry, we now intend to spread its usage to a larger audience with practical demonstrations to the end users. Such meets would help us to showcase the benefit of Indane 'NANOCUT' to customers highlighting its superiority in metal cutting industry with higher flame temperature, higher heat output, better cutting finish, low consumption of LPG and safer than oxy-acetylene usage.

I believe that business has only two functions - Marketing and Innovation. While we would expand the marketing framework of Indane Nanocut to a larger audience, it is the innovative properties of Indane Nanocut that would signature our success in this promotional foray.

LPG Team, IndianOil in Tamil Nadu, is open to any suggestions and feedback on the performance of this product. I am sure our customers would reap the benefits of this unique nanotechnology intervention, which will lead to economies of scale and improvement in their profits.

Sd/-

Gurmeet Singh
Director (Marketing), IndianOil



**MESSAGE FROM
MR. R. SITHARTHAN, EXECUTIVE DIRECTOR (TNSO)**

I am very happy that IndianOil's Nanocut, a true 'Make In India' product from IndianOil is realizing wider acceptance and adoption. This unique patented product has won International recognition and is a coveted brand from our Research and Development vertical.

Indane Nanocut, with its proprietary additive formulation innovated at IndianOil R&D Centre Faridabad, is highly suitable for high temperature industrial applications.

It enhances efficiency of LPG as a cutting gas, with high flame temperature, heat throughput, low oxygen consumption, reduced cylinder inventory, thereby leading to better economy.

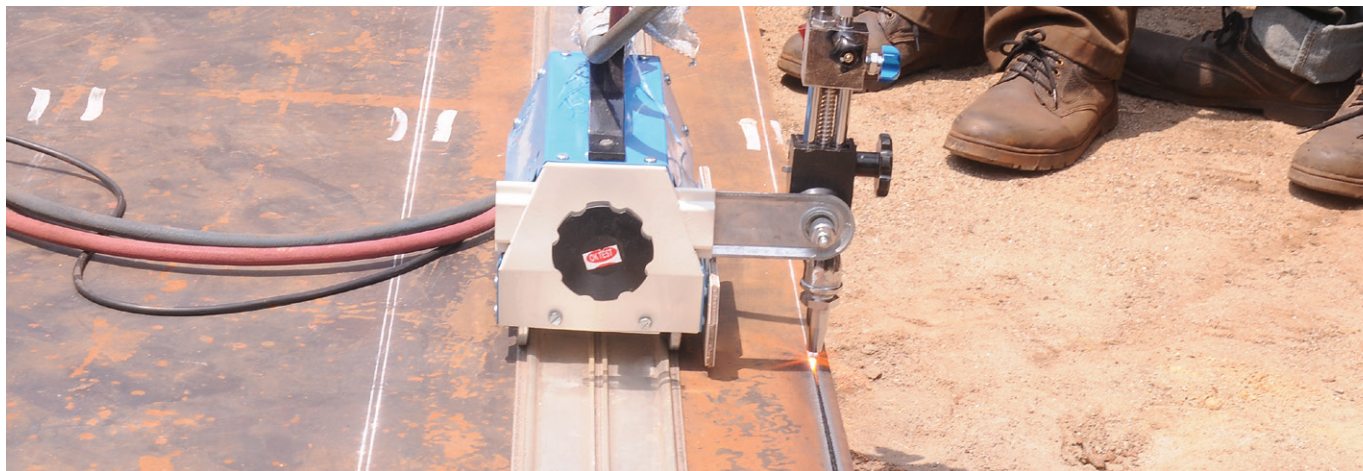
With superior Customer Experience, Indane Nanocut is a testimony to the Innovation Culture in our company. Customer expectations are fast changing. Innovation is the only way to keep pace with this change.

Showcasing Indane Nanocut in Customer Meets would go in a big way to demonstrate to end users the superior strengths of this product.

Sd/-

R. Sitharthan

Executive Director
Tamil Nadu State Office



HIGH-THERM INDANE CUTTING GAS

Besides being India's largest commercial enterprise and the highest ranked Indian company in Fortune's Global 500 listing, IndianOil is also India's most valuable and most trusted petroleum superbrand. With its 42,000 retail touch points, IndianOil is the undisputed leader in petroleum marketing, reaching out to every nook and corner of the country. IndianOil through its advanced R&D facility with about 650 active national and international patents to its credit, has now developed Indane NANOCUT.

Indane NANOCUT, the high-therm cutting gas, is a brand new product from the stable of IndianOil's brands personifying the ethos of IndianOil to design products around the customer needs.

WHY INDANE NANOCUT?

Conventionally metal cutting applications involve the use of oxy-acetylene mixture. Owing to its high shock sensitivity and very large flammability range, use of oxy-acetylene gas in metal cutting is fraught with the potential hazard of explosion during usage/ storage and hence is being increasingly discouraged despite its advantages of higher flame temperature and calorific value. The search for a safer, cheaper and widely available alternative to oxy-acetylene has led to Liquefied Petroleum Gases (LPG) emerging as an effective option for metal cutting applications. However, the comparatively lower flame temperature of LPG, imposes a limitation on high temperature applications like metal cutting. This has been a dampening factor in the wider use of LPG as a cutting gas.

INDANE NANOCUT BENEFITS

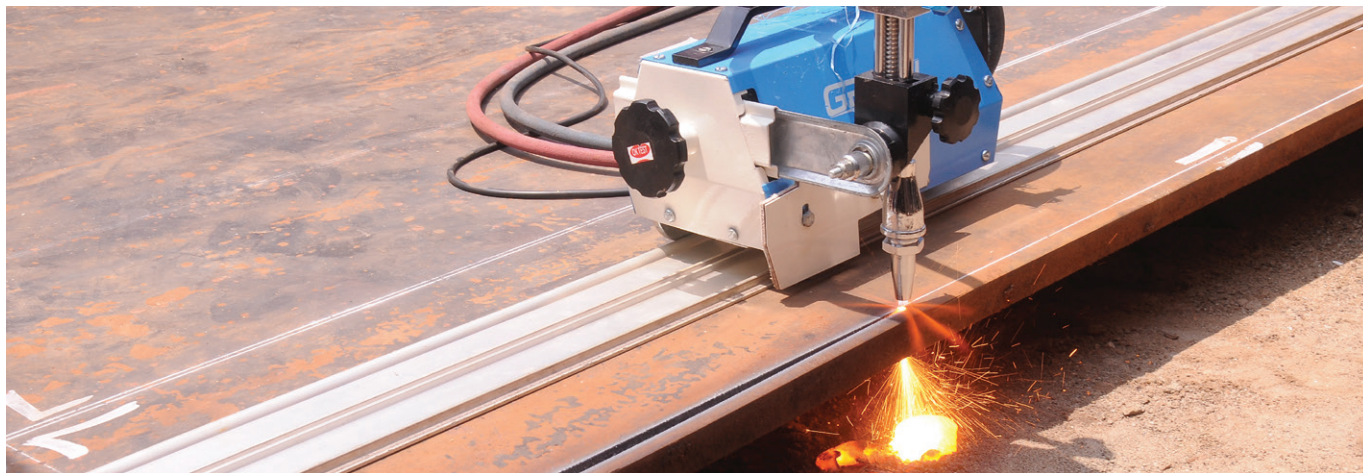
- Industrially acceptable safe alternative to the oxy-acetylene cutting process
- Extremely high flame temperature (adiabatic inner flame temperature in oxygen-3100°C)
- Superior metal cutting ability in terms of higher heat output compared to the commercial reference cutting gas, enabling cutting jobs with larger cross sections
- Lower consumption rates, shorter pre-heat time, excellent cut surface finish, improved penetration & culling speed, finer kerf, sharper key-hole formation and less oxide / slag formation for all thicknesses of plates

A 'MAKE IN INDIA' PRODUCT

With the primary objective of enhancing the performance of LPG for high flame temperature applications, IndianOil's R&D with its cutting edge technology has developed an innovative proprietary additive formulation. This additive, developed in-house, enhances multi-fold the efficiency of LPG as a cutting gas in terms of high flame temperature, heat throughput, lower oxygen consumption and cost effectiveness. Indane NANOCUT - a new product from IndianOil, addilised with this new formulation, is a superior cutting gas that provides a range of solutions for high temperature industrial applications including metal cutting.

Indane NANOCUT, widely available through the extensive distribution network of IndianOil, ensures faster, cleaner and sharper cuts with reduced slag and wastage. The cost effective NANOCUT consumes much lesser oxygen and gives out a soot-free and low glare flame while operating at lower operating pressures. Indane NANOCUT can be easily transported and stored at site and is also absolutely safe to handle with much lower torch nozzle maintenance.

Indane NANOCUT has a proven compatibility to industrial cutting gas distribution systems made of metal, rubber, and plastic components and is operator-friendly with superior HSE performance.



INDANE NANOCUT - POTENTIAL APPLICATIONS

- Indane NANOCUT is highly recommended for sectors involving metal cutting, heating, straightening, hardening, welding, soldering, brazing, coating etc. which are currently using either oxy-acetylene or standard LPG. Indane NANOCUT will provide a thermal temperature much higher than that of LPG or other commercially available LPG based products. The superior performance of Indane NANOCUT has been established through extensive field trials and testing by various laboratories
- Cutting of carbon steel, low, medium & high alloy steel plates / ingots of any desired thickness
- Flame hardening applications
- Other industrial heating applications

INDANE NANOCUT- CERTIFICATION BY WELDING RESEARCH INSTITUTE

- Performance on shop floor / on site was rated EXCELLENT
- Higher cutting speeds achieved even beyond AWS recommended speeds for all thicknesses without compromising performance
- 10-20% savings of Oxygen and LPG consumed was observed
- Has provided comparable pre-heat times for all thicknesses as against Oxy-Acetylene (DA)
- Very good surface finish and lesser oxide layer formation was observed
- Able to cut bevel at different angles (45 and 60) with good surface finish
- No pressure drop was found up to 15 meters of LPG circuit hose
- The backfiring tendency in the nozzle was observed to be NIL
- The fumes were bright with lesser odor as compared to normal LPG
- The formulation is found to be highly operator friendly

NANOCUT - PERFORMANCE CERTIFICATE

| | | |
|---|---|--|
| | | Bharat Heavy Electricals Limited (A Government of India undertaking) WELDING RESEARCH INSTITUTE, Tiruchirappalli - 620 014 Website: http://www.wriindia.com |
| K Ganesh Kumar Principal Investigator | American Welding Society Educational Institution Member | |
| PERFORMANCE CERTIFICATE | | |
| This is to certify that we have evaluated the Indane Nanocut commercial LPG Cutting gas candidate formulations for their performances vide Work Order No. 24591027 dated 07.11.2015. | | |
| The following are certified: | | |
| <ol style="list-style-type: none"> 1. Of the two formulations supplied for evaluation to WRI, viz., Candidate cutting gas formulation having lower dosage of additive (Yellow) (Y) and Commercial Indane Nanocut Gas (White) (W), the formulation identified as "W" was superior in all aspects of cutting parameters evaluation. 2. The formulation "W" was also provided to BHEL shop floor for evaluation. The feedback received from the shop floor on the performance of the "W" formulation was good. 3. The commercial Indane Nanocut formulation was also tested onsite at a workshop of a third party vendor for its comparative performance against the commercial LPG cutting gases. The results of the Commercial Indane Nanocut gas were observed to be superior. | | |
| The information is provided on the basis of observed results on test conditions at WRI and procedures adopted as detailed in the report submitted against the referenced work order. | | |
| (K. Ganesh Kumar) Dated 21.10.2016. | | |
| Regd. Office: BHEL HOUSE, Siri Fort, New Delhi - 110 049 | | |

EVALUATION OF INDANE NANOCUT BY WRI TRICHY

Indane Nanocut evaluated at BHEL fabrication shop for field performance against the conventional Oxy-Acetylene

- Evaluations carried out for cutting 55mm carbon steel plate
(highest thickness currently used by Trichy Boiler plant)
- Comparable performance observed with at par surface finish
- No pressure drop issues up to 15m distance of delivery of gas
- Operator friendly performance

Evaluation of Indane Nanocut for higher thickness

- Comparative evaluations carried out for cutting 300mm carbon steel plate
- Higher ease of flame penetration of Indane Nanocut at same oxygen pressure of 8 bar

Evaluation for ability to cut bevels in plates

- Bevels were cut at 45° & 60° angles on 32mm plate
- Excellent cut surface finish was observed

| Particulars | Propane | n-Butane | INDANE LPG | Acetylene | INDANE NANOCUT |
|--|-------------------------------|--------------------------------|------------------------|-------------------------------|--------------------------------|
| PHYSICAL PROPERTIES OF GASEOUS FUELS | | | | | |
| Chemical Formulae | C ₃ H ₈ | C ₄ H ₁₀ | n-Butane & Propane Mix | C ₂ H ₂ | Additised Butane - Propane Mix |
| Max. Vapour Pressure in kPa at 40°C | 1550 | 520 | 1050 | 600 | 1050 |
| Liquid Density at 1.013 bar & at Boiling Point (kg m ⁻³) | 580.88 | 601.26 | 560.54 | 378.20 | 560.54 |
| Specific Gravity of Gaseous Phase air=1 | 1.55 | 2.08 | 1.75 | 0.91 | 1.75 |
| Boiling Points at 1.013 bar (°C) | -42.11 | -0.49 | -2 | -84.7 | -2 |
| Liquid / Gas equivalent at 1.013 bar and at 15°C (vol / vol) | 306 | 236 | 270 | 663 | 270 |
| COMBUSTION PROPERTIES | | | | | |
| Auto Ignition Temperature (°C / °F) | 480/896 | 405/761 | 488/910 | 325/617 | 488/910 |
| Ideal Combustion Ratio (Oxygen to gas) | 4.3:1 | 5.1:1 | 4.7:1 | 1.2:1 | 4.7:1 |
| Ideal Combustion Ratio (Air to gas) | 20.5:1 | 24.3:1 | 22.4:1 | 5.7:1 | 22.4:1 |
| Gross Calorific Value (MJ m ⁻³) | 101 | 133 | 117 | 59 | 117 |
| Adiabatic Inner Flame Temperature in Oxygen (°C)* | 2588 | 2596 | 2594 | 3200 | 3100 |
| Inner Flame Temperature in Air (°C)* | 2034 | 2039 | 2037 | 2500 | 2650 |
| Max. Inner Flame Temperature (°C)* | - | - | 1934 | - | >>2300 |
| HSE DATA | | | | | |
| Backfire Tendency | Low | Low | Low | High | Low |
| Shock Sensitivity | Stable | Stable | Stable | Unstable | Stable |
| Toxicity | Low | Low | Low | Low | Low |
| Flammability Limits in Air (%) | 2.20-9.50 | 1.50-8.50 | 1.80-9.50 | 2.40-83.00 | 1.80-9.50 |
| Flammability Limits in Oxygen (%) | 2.40-57.0 | 1.60-51.0 | 2.40-57.0 | 3.0-93.0 | 2.40-57.0 |

*Calculated values *Experimental values using thermocouple

Typical savings potential from usage of Indane NANOCUT

| Plate thickness% | Reduction in consumption of cutting gas (vis-a-vis commercial LPG products) |
|------------------|---|
| 10mm-25mm | 15% |
| >25mm | 30% |



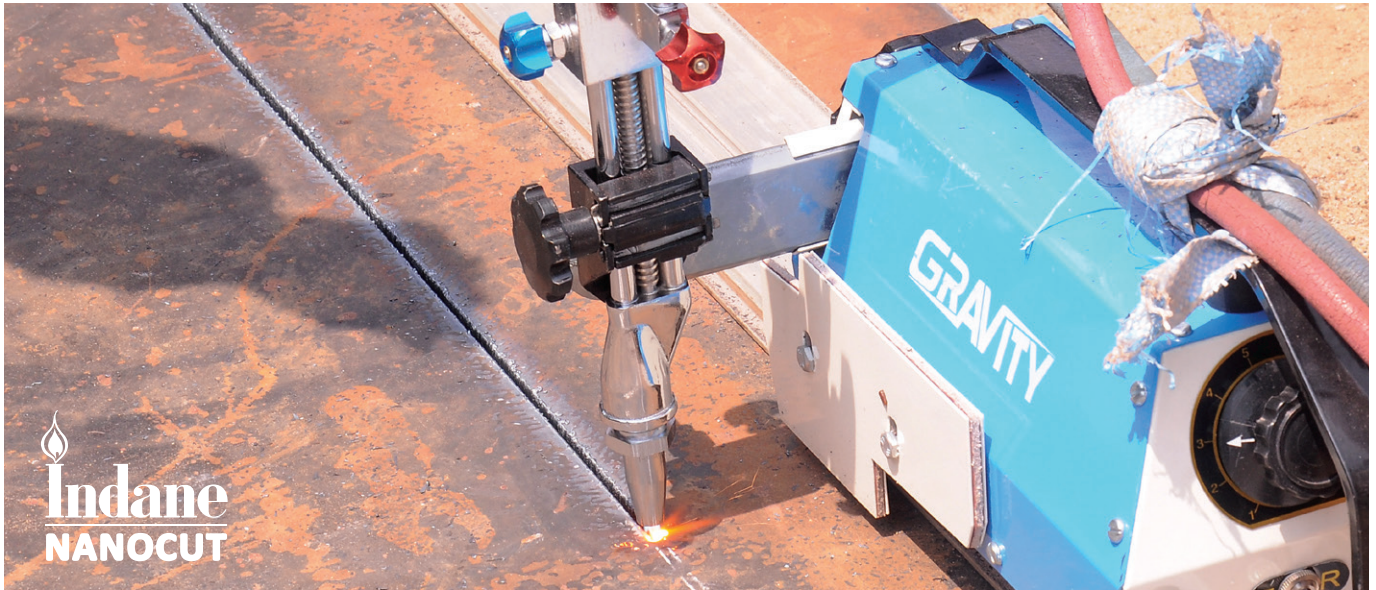
Indane NANOCUT

ESTEEMED USERS OF INDANE NANOCUT

- Indian Railways
- SAIL
- Bridge & Roof Co. of India Ltd.
- Neyveli Lignite Corporation, Chennai
- Braithwaite & Co. - Kolkata
- BGR Mining - Neyveli
- Rail Wheel Plants

CUTTING EFFICIENCY

- Performed excellently at Steel Plants, ship braking yard, Alang and Bhavnagar in Gujarat. Successfully cut metal sheets upto 400 mm
- Able to cut Bevel with superior cut surface finish
- Indane NANOCUT has been certified by WRI, Trichy for superior cutting performances



COMPATIBLE WITH BOTH AUTOMATED AND MANUAL HAND-HELD TORCH SYSTEM

HANDLING & PROTECTION:

Personal protective equipment (PPE) is critical in a fabricating shop involved in metal cutting operations for several reasons. Occupational Safety is of immense importance for the industrial sector. Hazards exist in every workplace in many different forms and controlling a hazard at its source is the best way to protect employees.

Employers must provide personal protective equipment (PPE) to their employees and ensure its use. Examples of PPE but not limited to items such as gloves, foot and eye protection, protective hearing devices (earplugs, muffs) hard hats, and full body suits.



Available at all Indane Distributors.

For more information contact

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