

योगः कर्मसु कौशलम्

"Excellence at work is 'Yog' - the union of one's consciousness with the supreme."

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PRAG INNOVATION AT WORK



► ABOUT US

PRAG GROUP OF INDUSTRIES, HEADQUARTERED IN LUCKNOW, INDIA, IS A LEADING MANUFACTURER OF A WIDE RANGE OF SPECIALTY ENGINEERING PRODUCTS FOR RAILROAD APPLICATIONS.

PRODUCTS RANGE FROM SPECIALTY RUBBER - METAL BONDED PRODUCTS TO A VARIETY OF POLYURETHANE PRODUCTS, A WIDE RANGE OF FILTERS AND FILTRATION SYSTEMS, AIR BRAKE SYSTEMS, BUFFERS AND DRAFT GEARS, AIR DRYERS, RAILWAY HVAC SYSTEMS, WATER COOLERS, AUTOMATIC DOORS SYSTEMS, AND AUXILIARY POWER UNITS.

OUR VISION

OUR VISION IS TO BE AMONGST THE BEST CUSTOMER-FOCUSED-ENGINEERING-INNOVATION PROVIDER FOR THE RAILROAD INDUSTRY.

MISSION STATEMENT

WE ENDEAVOR TO UNDERSTAND OUR CUSTOMERS' REQUIREMENTS SO WELL AS TO BE ABLE TO OFFER COMPREHENSIVE TAILOR-MADE SOLUTIONS ADDRESSING THEIR SPECIFIC PROBLEMS WHILE ENSURING THAT THE SOLUTIONS DELIVERED TO THEM ARE OF THE HIGHEST QUALITY AND RELIABILITY, INCORPORATE THE LATEST TECHNOLOGY, ARE ECO-FRIENDLY, AND ARE OFFERED AT A COMPETITIVE LIFECYCLE COST.

Prag was founded in 1983, when Mr. Rakesh Jain, a B.Com. (Honors) graduate from Sri Ram College of Commerce, set up a workshop for the manufacture of agricultural diesel engine fuel-injection elements and locomotive spare parts under the guidance of his father Mr. S. P. Jain, an acclaimed Tool Room engineer of his time.

This workshop, with a staff of 15 employees and total area of 6,000 sq. ft., marked the humble beginning of a group whose foundation was laid on relentless hard-work, uncompromising

quality, and a vision of constant improvement, innovation, and continual forward movement.

From our modest roots laid down in 1983, Prag gradually branched out into in the fields of Railway Bogie Suspension, Longitudinal Energy Management, Filters & Filtration Systems, Air Brake Systems, HVAC Systems, Engineered Systems and Driver Training Simulators.

Today, the group has several manufacturing facilities with a workforce of over 400 employees

and covered manufacturing area of more than 250,000 Sq. Ft., offering one of the most diversified product portfolios in the industry.

THERE WERE NO BANK
BALANCES, CAPITAL ASSETS,
OR MANAGEMENT TEAMS;
THE ONLY REAL RESOURCES
WERE MY PASSION, VISION,
AND A RESOLVE TO DELIVER
THE VERY BEST.

Rakesh Jain, Founder & Chairman

OUR JOURNEY

1987 -

Rubber and Rubber-Metal Bonded Products

1996

Automotive Mounts

2003

Locomotive Air Dryers

2005

Cast & Thermoplastic Urethane Products

2008

High Temperature Thermal Insulation Kits

2011

UIC Compliant Polspa™ Polymer Spring Packs

2013

Locomotive Draft Gears

2015

Pad 'F' for FIAT Bogie Secondary Suspension

2017

Bogie Suspension Kit for Fiat Bogies, Automatic Door Systems 1983

Small Precision Engineering Components for agricultural diesel engines

1991

Sugar Milling Equipment, Railroad Filters

2001

Locomotive Centrifugal Lube Oil Cleaners

2004

Plate-Type Lube Oil Coolers

2006

Pneumatic Clutches & Brakes

2010

Bogie Mounted Brake System

2012

Spinflo™ Air Intake Filtration

2014

Feed Valves & Auto Drain Valves

2016

Railway HVAC Systems, Auxiliary Power Units

2018

Onboard Water Purifiers with Cooler, VR Driver Training Simulators

THE PRAG PARIVAAR

"WE STRONGLY BELIEVE THAT A COMPANY IS ONLY AS GOOD AS THE PEOPLE BEHIND IT. OUR LOYAL AND DEDICATED WORKFORCE THAT WE BELIEVE IS OUR SINGLE MOST IMPORTANT ASSET, HAS OVER TIME BLENDED INTO A LARGE FAMILY THAT WE CALL THE PRAG PARIVAAR. MEMBERS OF THE PARIVAAR WORK COLLABORATIVELY IN A CONDUCIVE WORK ENVIRONMENT THAT PROMOTES PROFESSIONAL AS WELL AS PERSONAL GROWTH OF EACH AND EVERY MEMBER, HELPING THEM SHOULDER HIGHER RESPONSIBILITIES. IT IS THIS EXCEPTIONAL BONDING OF OUR PEOPLE THAT ENABLES THEM TO REALIZE THEIR FULL POTENTIAL AND OFTEN PERFORM MIRACLES AT WORK."

Gokul Jain, CEO



RAKESH JAIN
Chairman & Managing Director
B. Com. (Hons.)
Sri Ram College of Commerce - 1976



GOKUL JAIN
Chief Executive Officer
M.B.A., Kellogg School of Management, USA - 2013
M.S. (Industrial & Systems Engineering),
The Ohio State University - 2006



SARTHAK JAIN
Chief Operating Officer
Master of Professional Accountancy,
Royal Melbourne Institute of Technology - 2015
BA. LLB (Hons.) Amity Law School - 2011

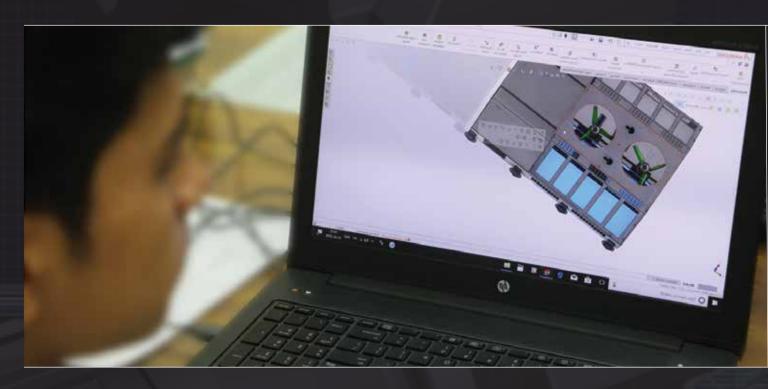


Our diverse team consists of passionate and talented individuals who, between them, have vast experience in the engineering industry. Their strong work ethics, remarkable commitment, and thirst for excellence have been cornerstones of our success.

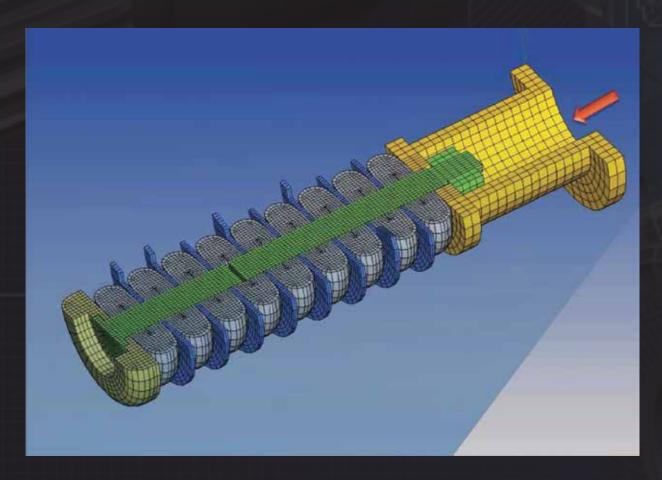
As a technology driven company, we constantly strive to nurture a culture of innovation and learning where our engineering team is constantly updating their skills and know-how through research and close dialog with international technology leaders.

It is only through the engineering knowledge of our people combined with their subject-matter expertise and passion for excellence that Prag is able to offer one of the most diversified and advanced range of specialty engineering products in the industry.



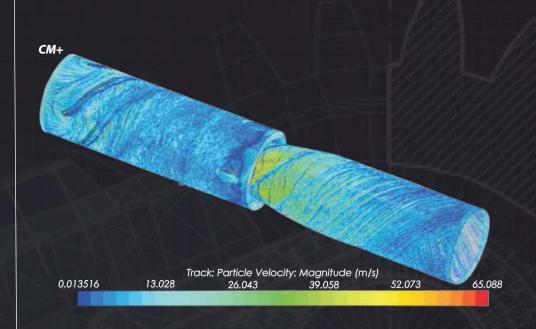


DESIGN & ENGINEERING



REDEFINING MOBILITY.®

SINCE 1983.



CAD MODELLING & CFD/FEA CAPABILITY

Prag maintains the latest technology and know-how using a combination of in-house research and design capability and leveraging partnerships with global technology leaders.

Development of any new product begins with extensive analysis and simulations on 3D models including FEA, Fatigue, Impact, and CFD analysis on linear as well as non-linear materials. Our in-house Design Center utilizes Siemens NX and Solidworks for 3D Modeling, CAM and electrical

schematic generation along-with specialized coil design software for design of bespoke heat exchangers for HVAC. 3D prints of designs are generated, when required, for analysis.

This enables us to generate the most optimum designs that have undergone extensive virtual testing well before actual prototyping and physical product development. For example, when designing a new filtration system, required filtering efficiencies and pressure drops are factored into

the design using CFD analysis at the product conceptualization stage itself. This helps us not only design a high-performance product but also drastically cuts down the time required for new product development.

Besides our in-fiouse engineering capabilities, we also have strategic alliances with global engineering major SAS Ingenieurbüro AG, Switzerland and with reputed international test-houses including TÜV SÜD, Germany.

MANUFACTURING FACILITIES.



Thermoplastic Urethane Moulding



Polyurethane Casting



Rubber Injection Moulding



CNC Machining Centres

Prag's state-of-the-art manufacturing facilities give us an edge when it comes to providing our customers with world-class engineering products. Machinery and equipment used at Prag come from some of the world's most reputed machinery manufacturers such as Klockner Desma, State Mix, Baulé, Tung Yu, L&T, Windsor, Moog, TAL, Electronica, Toshiba and Haas Automation.

Our automated assembly lines are equipped with fully computerized conveyor systems with poka-yoke and bar code sensors at each work station, ensuring compliance to operating procedures and complete product traceability.

The quality and reliability of products is accurately tested on our in-line computerized electronic test benches and RDSO approved test rigs.



Brake Cylinder Assembly Line

QUALITY CONTROL

OUR PRODUCTS, SOME OF WHICH ARE BACKED BY LIABILITY COVERAGE OF UP TO US\$ 1
MILLION AGAINST ONE SINGLE MANUFACTURING DEFECT, ARE BUILT TO PROVIDE YEARS OF
TROUBLE-FREE PERFORMANCE IN SEVERAL CRITICAL APPLICATIONS AROUND THE WORLD.

Sarthak Jain, COO



6-Axis Dynamic Testing Machine



Coordinate Measuring Machine



EMU CAB AC Test Lab



CNC Vibration Test Machine

Repeatedly exceeding customer expectations with products that provide exceptional performance & unfaltering reliability has been the driving force of Prag Group from our very inception. Quality is built into the manufacturing process starting from the raw material inspection stage right up to final product assembly. Standard quality checks are laid down at every step to ensure the highest level of quality and product traceability.

All of our extensive in-house testing facilities are ISO 9001:2008 certified and are equipped with some of the latest test equipment such as:

- Six-Axis Dynamic Endurance Test Equipment with Moog Controls
- Five-Axis Dynamic Brake Testing on CASNUB Bogie
- Coordinate Measuring Machine
- Spectrometers for Metal Testing
- HVAC Cooling Capacity Testing Facility
- Vibration Testing Machine
- Rheometers to Test Rubber Mix
- Computerized Universal Testing Machines
- Fire Retardancy & High Voltage Test Labs
- Environmental, Ozone Test & Low-Temperature Testing
- Computerized Functional & Leakage Test Equipment
- Air Filter Test Rigs designed and calibrated by IIT, Delhi





Complete Suspension Kit for LHB FIAT Bogies Polyurethane Constant Contact Side Bearing Locomotive Bogie Suspension Components

Heating, Ventilation & Air-Conditioning

Tower Type AC Unit for EMU Driver Cab Roof Mounted Package Unit for Trainsets

Air Brake & Compressed Air Supply

Bogie Mounted Air Brake System Heatless Regenerative Air Dryer Auto-Drain and Feed Valves

Automatic Sliding/Plug Door Systems

Internal Compartment Doors for LHB Coaches
Automatic Sliding / Plug Doors for Coaches





Auxiliary Power Units

Schlepsmart® APU for ALCo Locomotives

APU for GE India Next-Gen Locomotives

Filters & Filtration Systems

Railroad Air, Oil & Fuel Filters

Spinflo™ Cyclonic Air Inlet Filtration

Arcticove™ Onboard Water Purifier with Cooler

Longitudinal Energy Management Systems

Long Life High Capacity Locomotive Buffers

PolspaTM Polymer Springs for Buffer & Draft Gear

Draft Gear for EMD Passenger & Freight Locomotives

Soft Draft Gear with Yoke for ALCo & Electric Locomotives

Ecosafe VR Driver Training Simulators



BUFFERS & BUFFER SPRINGS



Polspa[™] Polymer Springs

Buffers Systems used on rail vehicles are continuously subject to enormous amounts of longitudinal forces. While offering adequate protection to the passengers or commodity being transported and to the rail vehicle body, the buffers also need to ensure smooth vehicle running dynamics and maximize passenger comfort.

Prag's 'Fit-and-Forget' High

Performance Polspa™ Polymer

Buffers are designed to deliver
high-energy absorption in

both draw as well as buff modes, minimize longitudinal jerks, and provide maintenance free performance over the entire life of the railcar. Polspa springs provide the most efficient energy absorption system for a given railcar weight and offer a life expectancy that is several times higher than that of either rubber or steel springs. The polymer material allows for a construction that is extremely light-weight yet can withstand extreme loads, impacts and temperature variations.

The polymer spring elements that form the Polspa Spring Packs are made up of a special highly engineered urethane material that has excellent damping characterstics as well as outstanding resistance to tear propagation and exhibits exceptional energy absorption properties.

Polspa Buffers meet and exceed the highest international quality standards including UIC-526-1 and UIC 528 and have successfully qualified extensive testing at UIC approved test labs in Germany.



Buffers fitted with Polspa[™] Polymer Spring

DRAFT GEARS

Prag's range of Draft Gears, including both rubber as well as polymer based draft gears, are built to perform continuously in the harshest of operating and environmental

The DG-70N Draft Gear is a Non-Friction Heavy
Duty Soft Draft Gear designed for use in Alco &
Electric Locomotives. It is fitted with a 70 kJ
PolspaTM Polymer Spring Pack, offering years of
maintenance-free performance and ensuring
much superior riding comfort and safety, as
compared to rubber-spring based draft gears.

PAC and MAC Draft Gears with laminated-rubber spring elements, designed for use on EMD locomotives, are engineered to perform in the heaviest of traction applications and offer adequate protection in draw as well as buff modes while absorbing buge amounts of energy.

The Balanced Draft Gear is an advanced design draft gear for use on IR LHB Passenger Coaches fitted with FIAT Bogies. Consisting of two separate packs of Polspa™ Polymer Springs separated by a metal plate, the Prag's BG-35N Balanced Draft Gear is designed to eliminate longitudinal jerks and enhance passenger safety and comfort.



EMD Draft Gear PAC

Soft Draft Gear DG-70N



Balanced Draft Gear for LHB

BOGIE SUSPENSION



Complete Bogie Suspension Kit

Rubber molding & Rubber
Metal bonding has been Prag's
forte since the very beginning.
The range of rubber products
offered by us is amongst the
most extensive in the industry
and is used in a multitude of
severe load-bearing and
vibration attenuation
applications.

We manufacture a range of shear pads, compression mounts, spherical bearings, rubber springs, and bushes for use in EMD Locomotive and LHB

Fiat Bogie suspension and are the first Indian manufacturer to be approved for manufacture and supply of the complete FIAT bogie suspension kit used in the LHB Coaches – the mainstay passenger coach of the Indian Railways.

Our energy management rubber products include a range of rubber buffer, draft gear and side bearer springs for use on locomotives, passenger cars and freight wagons.

ELASTA-FLEX® drum clutch elements are manufactured in Technical Collaboration with M/s Oil States Industries, USA. These products are designed for a multitude of severe clutch and brake applications in oilfield, mining, paper-logging and marine industries, as well as other industrial applications.







Vehicle Primary Suspension Air Springs for Secondary Suspension

Elastaflex® Oilfield Clutches & Brakes

FILTERS & FILTRATION SYSTEMS

Prag is a leading manufacturer of Air, Oil, and Fuel filters for railroad applications and has been providing comprehensive filtration solutions for all kinds of rolling stock

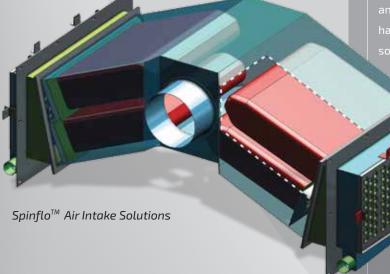
applications to the Indian Railways for

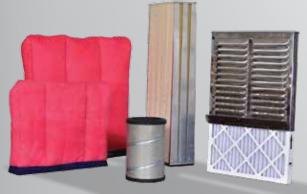
over two decades. Our highly experienced filtration technologists and engineering design team are constantly working to develop and qualify improved filtration products, backed by the

partners, **M/s Clark Filter, USA** [A Parker-Hannifin Group Compan ho are world's premier producers of railroad

Prag has been the pioneer for development of higher efficiency and longer life filters for the Indian Railways, having extended the filter replacement cycles from 30 days to over 180 days for most filtration products, and to over 240 days, in case of Jube oil filtration

designed to check tough contaminants including soot, rain, snow and sawdust from entering the engine room while offering minimal resistance to the flow of air. It is the only fully indigenous inertial air filtration system for use in railroad applications, removing up to 98% contaminants at the primary filtration stage itself.





Air Filters



Oil & Fuel Filters

BOGIE MOUNTED BRAKE SYSTEM



Prag Bogie Mounted Brake System is a unique parallelogram design brake system for freight wagons, manufactured under the license of and transfer-of-technology from M/s Knorr-Bremse (Germany).

The brake cylinders are equipped with integrated double-acting slack adjusters, which maintain constant piston stroke, resulting in uniform and efficient braking performance. A Load Sensing Device [EL-60] – UIC approved

design – senses loaded or empty conditions of the freight wagons, and provides a visual indicator showing brake cylinder pressure proportioning, and also sends out pneumatic signals that govern the magnitude of braking forces. This helps protect the wheels by reducing empty-car braking forces that can result in costly wheel skidding, especially under adverse weather or track

This highly reliable design is

AAR approved and is designed
to minimize weight and deliver
optimum braking performance,
which results in uniform shoe
and wheel wear. Over 15,000
freight wagons fitted with Prag
Air Brake System are in active
service in the Indian Railways.





COMPRESSED AIR SUPPLY EQUIPMENT



Air Dryer PP-AD-01

Prag designs and manufactures a range of equipment used for supply and treatment of compressed air for railroad air brake systems. These include Heatless Air Dryers, Auto-Drain Valves, Feed Valves, Coalescer

One of our most notable innovations is Prag

AquacheckTM Heatless Regenerative Air Dryer System.

This vibration-resistant, compact and lightweight Air

Dryer is designed to remove moisture and oil aerosols

from compressed air and ensure continuous supply of
clean and dry air to the air brake system. The design

was provided to the Indian Railways on Technology
Transfer basis in 2003 and has been adopted by them

as a standard on their Diesel & Electric Locomotive

Fleet as well as on EMU & DEMUs.

Prag offers five different Aquacheck™ models catering to a wide range of rolling stock. The system is in active service on over 2000 locomotives. Optional heaters can be provided wherever required for operation in sub-zero ambient conditions.



Feed Valve



Auto Drain Valve



MR Filter Assembly

H.V.A.C. SYSTEMS

With hundreds of commuters
often crowded onto train
carriages during peak
hours, passenger
comfort is a major concern
for railway operators around
the world and especially in India.
Sweltering temperatures and
claustrophobic conditions in the summer
months often drive rail travellers to the edge.

Prag's efficient heating, ventilation and air conditioning system (HVAC) are designed to mitigate the misery of passengers by regulating temperature and air quality on crowded trains battling with accumulated body heat.

Our strength lies in innovation, rapid prototyping, and designing of bespoke HVAC solutions with attention to passenger requirements.

Our HVAC System design process begins with a detailed study of the operating environment, car volume, solar loading, peak passenger traffic, and airflow within compartment. Some of our important HVAC innovations include the first introduction of Driver Cab Air Conditioning in Mumbai Suburban EMU Service and Coach HVAC for the prestigious Train-18 project of the Indian Railways.

Recently, we have tied up with Camfil Group – the world leader in clean air solutions – to integrate their air purification and odor removal technology into our railway HVAC solutions.



Passenger Coach RMPU

EMU Driver Cab AC

HEAT EXCHANGERS & WATER PURIFIERS



Arcticove[™] Water Purifier with Cooler



Plate Type Heat Exchanger

Prag was amongst the first to develop a completely indigenous Plate Heat Exchanger for Locomotive application with the introduction of PHE-01 Plate Type Lube Oil Cooler in 2004.

Designed to offer the most optimum thermodynamic performance, the PHE-01 heat exchanger has been in use on Diesel-Electric Locomotives in India for more than 10 years. Heat Transfer SS plates and Rubber Gaskets used in PHE-01 are manufactured on fully automatic presses in accordance with the highest quality standards. Our team is equipped to develop custom-designed Plate Heat Exchangers as per specific customer requirements.

The Prag-Inge® Water Purifier System, built using NSF Certified Inge® Multi-Bore Ultrafiltration technology with intermittent auto-flushing arrangement, has been in active service in IR Passenger Coaches since 2016.

The Prag-Inge® Water Cooler System – an integrated water purifer-cum- cooler system having a robust vibration resistant and vandal-proof stainless steel construction specifically for on-board use on railway passenger coaches was developed in 2018.

AUXILIARY POWER SYSTEMS



Locomotive Auxiliary Power Supply System

more and more crowded due to locomotives remain immobile for

locomotive batteries



DIESEL ENGINE

GHP RPM 1500

No. of Cylinders Cooling Water Cooled



COMPRESSOR

1500 No. of LP Cylinders No. of HP Cylinders Discharge Pressure 10.2Kg/€m



ALTERNATOR

3-Phase Brushless Type RPM 1500 Output Voltage 72v <u>+</u> 1VDC Max Current 27 A

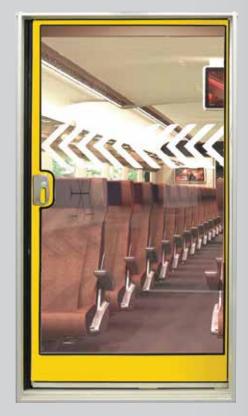
AUTOMATIC DOOR SYSTEMS

In line with Prag's constant endeavor to contribute towards technological upgradation and modernization of the Indian Railways and enhancement of passenger safety and comfort, in 2017 the group entered into a technological collaboration with **Pars Komponenty, Studénka** - a Czech engineering and technology company with a manufacturing tradition of 115 years in development and production of mass transit components.

Pars has an extensive experience in the manufacture of automatic plug doors, electric sliding doors, swinging doors for drivers and inter-vehicle wing doors in addition to tilting and fixed windows for subways and suburban trains, offering high-technology products for the most demanding railway applications and boasts of a client list that includes the likes of Škoda Transportation, Bombardier, Alstom, Siemens, and Stadler Rail.

Prag and Pars have jointly signed a long-term strategic cooperation agreement for development and introduction of automatic sliding and plug doors in the Indian Railways. The product design will be developed by Pars in accordance with IR requirements and the serial production will be realized at Prag's manufacturing facility in India under the technology and guidance of Pars Komponenty, providing the internationally established Pars technology at indigenous manufacturing costs to the final customer

The first product developed under this collaboration is the lightweight ergonomically designed automatic sliding door system for Train-18 Passenger compartment - a full-glass interior sliding door system for the new state-of-the-art trainset launched by the Indian Railways.



Internal Compartment Automatic Door Systems



Main Entrance Automatic Door Systems

EVENTS AND EXHIBITIONS.



Innotrans 2014 - Berlin



Innotrans 2016 - Berlin



InnoRail 2014 - Lucknow



InnoRail 2016 - Lucknow

It is our endeavor to continually educate our customers about our product offerings and their benefits and to reinforce our commitment to innovation, quality, and consistency. We ensure active engagement with our customers through regular interactions and participation in well-known industry tradefairs such as IREE [New Delhi], Innorail [Lucknow], IRCE [Chennai] and Innotrans [Berlin].



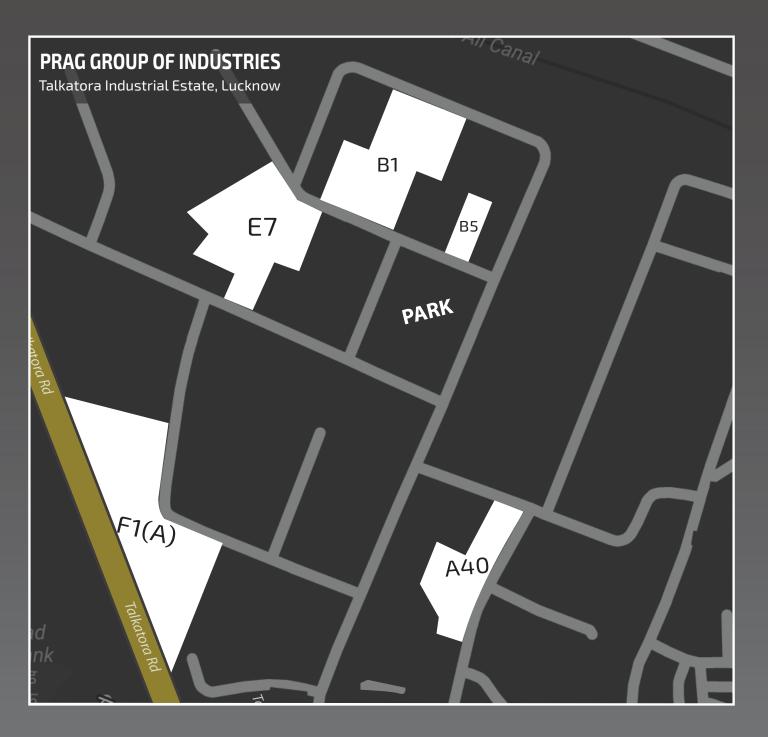
Prag Team along with our Technology Partners @ IRCE 2018



IREE 2017 - New Delhi



IRCE 2018 - Chennai



E7 RUBBER & POLYMER PRODUCTS

CORPORATE OFFICE

A40 AUTOMATIC DOORS H.V.A.C ASSEMBLY DESIGN OFFICE

COMPRESSED AIR SUPPLY EQUIPMENT
BOGIE MOUNTED BRAKE SYSTEM
CNC MACHINE SHOP
AIR & OIL FILTERS
SHEET METAL FABRICATION
ALUMINUM CASTING
AUXILIARY POWER UNITS
AIR DRYER & HEAT EXCHANGERS
WATER PURIFIERS CUM COOLERS

B5 SHEET METAL SHOP

F1 (A) FILTER PLANT
RUBBER & POLYMER PRODUCTS
PNEUMATIC CLUTCHES & BRAKES
AIR SPRINGS

PRAG INNOVATION AT WORK



HAND IN HAND, ALWAYS.

OUR TECHNOLOGY PARTNERS



















Lankhorst | Mouldings









With modern engineering and technology aspiring to higher & higher frontiers, we are continuously updating our know-how through partnerships with premier institutions like Indian Institute of Technology and Technical Collaborations with specialist technology companies to maintain our position as leaders in technological change and to provide our customers with hi-quality bespoke engineered products using cutting-edge technology.

BY LEVERAGING OUR RELATIONSHIPS WITH WORLD-RENOWNED TECHNOLOGY LEADERS IN **ADDITION** TO **USING HOMEGROWN TECHNOLOGY** AND IN-HOUSE DESIGN CAPABILITY, WE ARE ABLE TO GENERATE WHAT WE CALL 'GLOBALLY SEGMENTED INNOVATION', WHERE THE FINAL PRODUCT DRAWS ON THE **EXPERTISE** OF MULTIPLE TECHNOLOGY EXPERTS FROM AROUND THE WORLD. **5**5



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:: CIN ::

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