

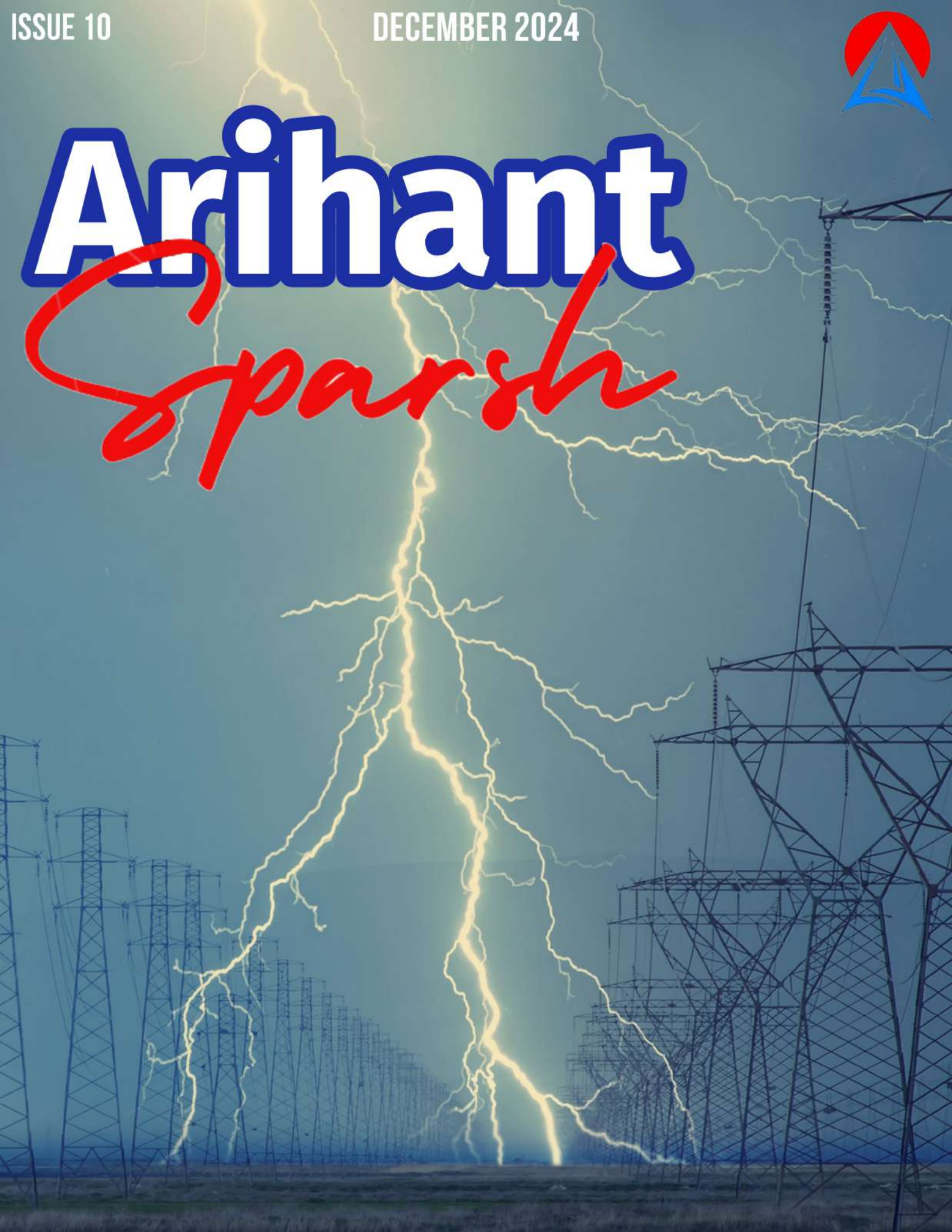
ISSUE 10

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# Arihant

*Sparsh*



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# MOSFET Technologies for Electric Vehicles (EVs) - Sudhakar Sharma

## Introduction

MOSFETs are key components in electric vehicles (EVs), used in inverters, battery management systems, DC-DC converters, and charging circuits. The main technologies—Super Junction (SJ), Silicon Carbide (SiC), and Gallium Nitride (GaN)—are compared in terms of performance, benefits, drawbacks, and their role in EV applications.

**Super Junction MOSFETs (SJ MOSFETs)** are an advanced type of silicon MOSFET offering lower on-resistance and better efficiency than traditional silicon devices, making them suitable for medium-power applications.

### Advantages:

- **Cost-Effective:** Cheaper to manufacture than SiC and GaN, using standard silicon processes.
- **Improved Efficiency:** Better conduction efficiency in mid-range power applications.
- **Mature Technology:** Well-established manufacturing with wide availability.

### Limitations:

- **Thermal Management:** Less efficient at high switching frequencies and voltages, generating more heat.
- **Lower Power Handling:** Not ideal for high-power, high-voltage applications.

**Current Use in EVs:** SJ MOSFETs are used in low- to medium-power applications like auxiliary power supplies, inverters for lower-end EVs, and charging circuits. They are also common in charging circuits and less demanding power control systems.

## Silicon Carbide (SiC) MOSFETs

SiC MOSFETs are designed for high-efficiency, high-voltage, and high-temperature applications, leveraging SiC's wide bandgap for better performance.

### Advantages:

- High Efficiency: Low conduction and switching losses, ideal for high-power applications.
- High Voltage & Thermal Tolerance: Can handle up to 1200V and 200°C, making them perfect for EV inverters.
- Compact Systems: Reduces cooling requirements, enabling smaller power systems.

### Limitations:

- Cost: More expensive due to material and manufacturing costs.
- Availability: Supply chain still developing.

**Current Use in EVs:** Common in high-power applications like EV inverters, DC-DC converters, and battery management systems (BMS).

## Gallium Nitride (GaN) MOSFETs

GaN MOSFETs offer superior performance with ultra-fast switching and low losses, excelling at high frequencies.

### Advantages:

- Ultra-Fast Switching: Enables smaller, lighter power systems.
- Very High Efficiency: Low conduction and switching losses, ideal for high-frequency applications.
- Compact Size: Smaller and lighter, crucial for EVs and charging systems.

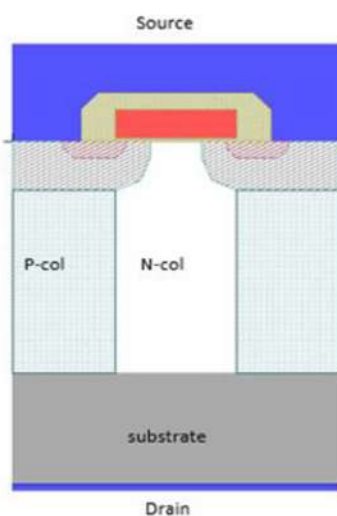
### Limitations:

- Cost: Expensive due to less mature manufacturing.
- Voltage Rating: Typically limited to 650V, restricting use in ultra-high-voltage applications.

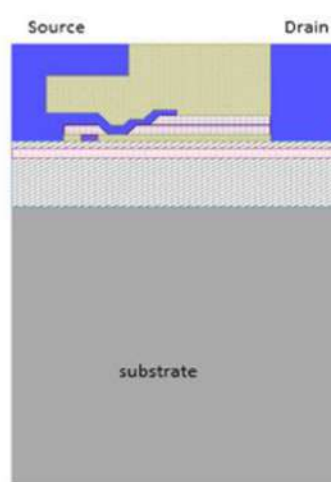
**Current Use in EVs:** Emerging in high-frequency chargers, DC-DC converters, and compact on-board chargers.

# Comparative Summary:

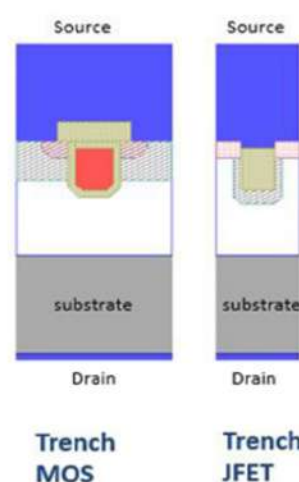
Feature	SJ MOSFETs	SiC MOSFETs	GaN MOSFETs
Efficiency	Moderate	High	Very High
Cost	Low	High	High
Voltage Tolerance	Up to 600-900V	Up to 1200V or more	Up to 650V
Thermal Performance	Moderate	Excellent	Good
Switching Speed	Moderate	High	Very High
Size & Weight	Larger	Smaller	Very Compact
Current Applications	Low-power systems	High-power inverters, BMS	High-frequency chargers, compact inverters
Future Potential	Stable for low-power	Dominant in high-performance EVs	Promising for next-gen EVs and fast-charging



Silicon Superjunction



GaN HEMT



SiC

## Conclusion

- **Super Junction (SJ) MOSFETs** are cost-effective and suitable for **low- to medium-power applications** in EVs, though they fall short in high-voltage and high-frequency settings.
- **Silicon Carbide (SiC) MOSFETs** are gaining popularity in **high-power EV systems** due to their excellent efficiency, voltage tolerance, and thermal management capabilities, making them ideal for inverters, DC-DC converters, and BMS in high-performance EVs.
- **Gallium Nitride (GaN) MOSFETs** offer the highest efficiency and fastest switching speeds, making them well-suited for **high-frequency charging systems** and **compact power electronics**. While they are not yet widely used in high-power applications, they are emerging as a strong contender for **next-generation EV technologies** and **fast-charging solutions**.

In the future, SiC is expected to dominate high-power applications in EVs, while GaN will likely be the technology of choice for **high-frequency charging systems** and **lightweight power electronics**. SJ MOSFETs, while still relevant for lower-power applications, will increasingly face competition from SiC and GaN in more demanding EV segments.

# SAFEGUARDING YOUR BUSINESS

- Ravinder Singh

## Business Security

In today's rapidly digitalizing economy, Indian businesses face unprecedented cybersecurity challenges. As an Information technology person in this vibrant ecosystem, I've witnessed firsthand the critical need for strong cybersecurity frameworks. Here, I'll share insights and practical examples to help Indian enterprises strengthen their defences in the cyber kingdom.

## The Indian Business Landscape and Cyber Threats

The digital transformation in India has accelerated business processes but also exposed companies to increased cyber threats. From startups to established corporations, every business is at risk. For example, a well-known Indian company recently experienced a major data breach, leading to substantial financial and reputational losses. Such incidents highlight the urgent need for cybersecurity.

## Why Cybersecurity is Essential for Indian Businesses?

For businesses in India, cybersecurity is no longer optional. It's a necessity to protect sensitive information and maintain customer trust. The rise in digital transactions, especially post-demonetization, has made companies targets for cyber-attacks like phishing and ransomware. Practical Steps Towards Better Cybersecurity

### Here are practical steps that businesses can take:

For businesses in India, cybersecurity is no longer optional. It's a necessity to protect sensitive information and maintain customer trust. The rise in digital transactions, especially post-demonetization, has made companies targets for cyber-attacks like phishing and ransomware. Practical Steps Towards Better Cybersecurity

1. Regular Risk Assessments
2. Employee Training
3. Adopting Advanced Security Measures
4. Incident Response Strategy
5. Compliance with Regulations

### Conclusion

In conclusion, As Indian enterprises adapt to an interconnected digital world, cybersecurity becomes essential for growth and flexibility. With vigilance and strategic defences, businesses can shield themselves from digital threats, ensuring their success in the digital era.

Leadership's Role in Cybersecurity As leaders, we must prioritize cybersecurity and integrate it into our business strategy. By fostering a culture that values security, we can ensure that protecting digital assets becomes a shared responsibility across the organization.

# WAR- ITS IMPACT ON GLOBAL ECONOMY

- **Tanushree Purohit**

The global economy is feeling the heavy toll of escalating wars in various parts of the world. From Ukraine to Sudan, and from the Middle East to the Sahel, conflicts are not only causing immense human suffering but are also creating ripple effects that touch every corner of the globe. Understanding these impacts is crucial, as they affect everything from food prices to job markets.

One of the most immediate and visible impacts of war is on **energy prices**. The war in Ukraine, for instance, has disrupted global energy supplies since Russia is one of the world's largest energy exporters. Sanctions, supply chain interruptions, and infrastructure damage have sent shockwaves through oil and gas markets, driving up prices. This, in turn, increases the cost of transportation, manufacturing, and even household energy bills, leaving families and businesses struggling to make ends meet.

**Food insecurity** is another critical issue. Conflicts like those in Yemen, Sudan, and the Sahel disrupt farming, displace rural populations, and destroy critical agricultural infrastructure. Ukraine, often called the "breadbasket of Europe," has also seen its grain exports severely affected by the war, leading to global spikes in food prices. The impact is most devastating for developing countries that depend on imports for staples like wheat and maize.

Wars also **strain national budgets**. The global supply chain is another casualty of war. Modern economies are interconnected, relying on seamless trade across borders. Conflicts disrupt these systems by making transportation routes unsafe or entirely impassable. For example, maritime routes in the Red Sea have become riskier due to tensions in Yemen, threatening international shipping and trade.

While the immediate effects are devastating, the long-term consequences of these conflicts can be even more profound. Rebuilding destroyed infrastructure, restoring investor confidence, and addressing the societal scars of war take decades. And while wars rage on, their economic impact is felt by all of us, whether through higher prices, reduced access to goods, share market fluctuations or the diversion of resources from development to defence.

The rising number of conflicts worldwide is a stark reminder of how interconnected the global economy is. Resolving these wars and fostering peace is not just a moral imperative but an economic necessity for the well-being of the entire planet.

# सार्वजनिक दान का महत्व:

- प्रमोद जैन

प्रायः यह देखने सुनने में आता है, कुछ लोग कभी कभी या निरंतर दान, धर्म, जरूरतमंद को मदद करते हैं एवं अपने द्वारा किये गए कार्य की जानकारी सोशल मीडिया के माध्यम से अन्य लोगो से सांझा करते हैं। कुछ लोग उनके इन कार्यों की सराहना करते हैं तो कुछ लोग उस पर अपनी आपत्ति दर्ज करते हैं की उन्हें ऐसा नहीं करना चाहिए। दान करना है तो गुप्त रूप से करें। उन्हें अपने नाम का, अपनी ख्याति का लालच है इसलिए प्रचार कर रहे हैं। किसी को मदद देते समय फ़ोटो क्यों ले रहे हैं। जिसकी फ़ोटो ले रहे हैं फ़ोटो लेकर उसका अपमान कर रहे हैं, यह उनकी निजता में हनन है। यह भी कहेंगे हम भी यह सब करते हैं, परंतु उसका प्रचार नहीं करते।

यह सर्वथा उचित है की जिस हाथ से दान दे रहे हैं तो इतनी गोपनीयता से देना चाहिए की दूसरे हाथ को भी पता न चले। यही हमारी भारतीय संस्कृति है।

परंतु, यह बात सभी जानते हैं यह पंचम काल है। जैसे जैसे समय आगे बढ़ता जा रहा है धर्म का, संस्कृति का नाश होता जा रहा है। चारों ओर बुराई बढ़ती जा रही है, अच्छाई घटती जा रही है। ऐसे में धर्म एवं संस्कृति की रक्षा कैसे होगी ? अच्छाई को कैसे बचाया जाएगा ?

श्रीमान जी आज मार्केटिंग का जमाना है, प्रचार-प्रसार का जमाना है। यदि धर्म, संस्कृति एवं अच्छाई की मार्केटिंग नहीं की गई तो बढ़ती हुई बुराई धर्म, संस्कृति एवं अच्छाई को लील जाएगी। हर स्थान पर तो मददगार नहीं होते तो वह स्थिति कितनी पीड़ादायक होगी जब जरूरतमंद तक मदद नहीं पहुंचेगी। इसलिए लोगो की मदद करने एवं जरूरतमंद तक मदद पहुंचाने के कार्यों का खूब प्रचार करना आज की महती आवश्यकता है तांकि अन्य लोग भी उनके कार्यों से प्रेरित होकर अपने आसपास अपनी सामर्थ्य के अनुसार वैसे ही सामाजिक कार्य करें। जरूरतमंद को मदद से मतलब है किसी के फोटो लेने से उसका कोई अपमान नहीं होता। यदि ऐसा होता है तो स्वयं को उसका शुभचिंतक कहने वाले क्यों नहीं उनकी मदद करते ? जो यह कहते हैं हम भी यह सब करते हैं, परंतु उसका प्रचार नहीं करते। तो यह कह कर वे क्या कर रहे हैं ?

इस बात से इनकार नहीं किया जा सकता कि किसी को अच्छे कार्य करता देखकर अन्य भी वैसे कार्य करने के लिए प्रेरित होते हैं। इस प्रचार से ही किसी जरूरतमंद को यह जानकारी मिल पाती है की उसे कहाँ से मदद मिलने की संभावना है। इसलिए जिन्हें गुप्त दान करना है, वे गुप्त रूप से करें। जिन्हें अपने सदकार्यों को गोपनीय रखना है, वे रखें। लेकिन, किसी के अच्छे काम में अड़चन न डाले, उन्हें खूब प्रोत्साहित करें, उस पर आपत्ति न करे। आपकी सराहना के कुछ शब्द ही उनके जीवन की अमूल्य धरोहर हैं, आपके ये अमूल्य शब्द उन्हें ओर अधिक करने के लिए प्रेरित करेंगे। इसलिए उनके कार्यों के प्रचार में उनका सहयोग करें, उनकी वाह वाह करने से गुरेज न करे। यह न भूले, वे अपने कार्यों के फ़ोटो या जानकारी इसलिए नहीं दे रहे कि उन्हें कोई नेता बनना है या किसी चुनाव में खड़े होना है। उन्हें किसी मंच पर सम्मान पाने की या अपनी ख्याति की कोई अभिलाषा नहीं होती। इस कार्यों में आपसे ज्यादा उनकी मेहनत, उनकी ऊर्जा, उनका समय, उनका धन खर्च होता है। उनके प्रचार पर अधिकतर उन लोगो के पेट में मरोड़ उठती है जो स्वयं ऐसे कार्य नहीं करते, जो कभी भी सदकार्यों के लिए अपनी जेब में हाथ नहीं डालते। चूंकि वे स्वयं नहीं करते इसलिए उन्हें बुरा लगता है। क्या हर्ज है, यदि किसी के फोटो प्रचार से लोगो में अच्छाई बढ़ती है, क्या हर्ज है यदि किसी के फोटो प्रचार से अन्य लोग भी प्रेरित होकर अच्छे कार्य करते हैं। क्या गत कोरोना काल में इस प्रचार का महत्व हम सभी को बहुत अच्छे से नहीं समझा दिया है ?

कहने का तात्पर्य यह है की -

अच्छाई के वायरस को इतना अधिक फैला दो की वह बुराई के वायरस को ही खा जाए।

क्या कहते हैं करेंगे ऐसा ?



# Media & Events

## Arihant Tagline Top contributors



## Celebrations



# Media & Events

## Celebrations



# Birthdays

**Sanjay Sharma (Store)**

**Sonu Pandey**

**Kunal Shrivastava**

**Pushpendra Kumar Rajak**

**Patel Pratikkumar Arvindbhai**

**Rajesh Kumar (R&D)**

**Pankaj Kumar**

**Dinesh Kumar**

**Tanushree Purohit**



Happy  
*Birthday*

- **5th December**
- **8th December**
- **15th December**
- **15th December**
- **17th December**
- **18th December**
- **21st December**
- **23rd December**
- **26th December**

# Onboarding

1. **Saurabh Dixit (AVP Sales & Marketing)**
2. **Ajeet Kumar (Vendor Support Executive)**
3. **Naveen (Helper R&D)**
4. **Ravinder Sharma (Sr. Executive R&D)**
5. **Ajay Patap Singh (VMC Operator)**

**WELCOME  
TO  
THE  
TEAM**