

EVOLUTION OF INVERTER-FED  
HIGH EFFICIENT MOTER WITH

*HITACHI PARTIAL DISCHARGE  
RESISTANT ENAMELED WIRE*

**Hitachi Magnet Wire Corp.**

## *Demand of energy saving in industrial machinery field*

- Low enforcement of energy saving in United States which Prohibits selling inefficient motor
- High demand of efficient motor all over the world

**Inverter-fed motor is mainstream.**

## *Technical trend of inverter*

- Easy control
- Low noise



**Adoption of IGBT inverter**  
(Insulated Gate Bipolar Transistor)

Waveform: Pulse wave with high rise

## < Characteristics of Inverter output >

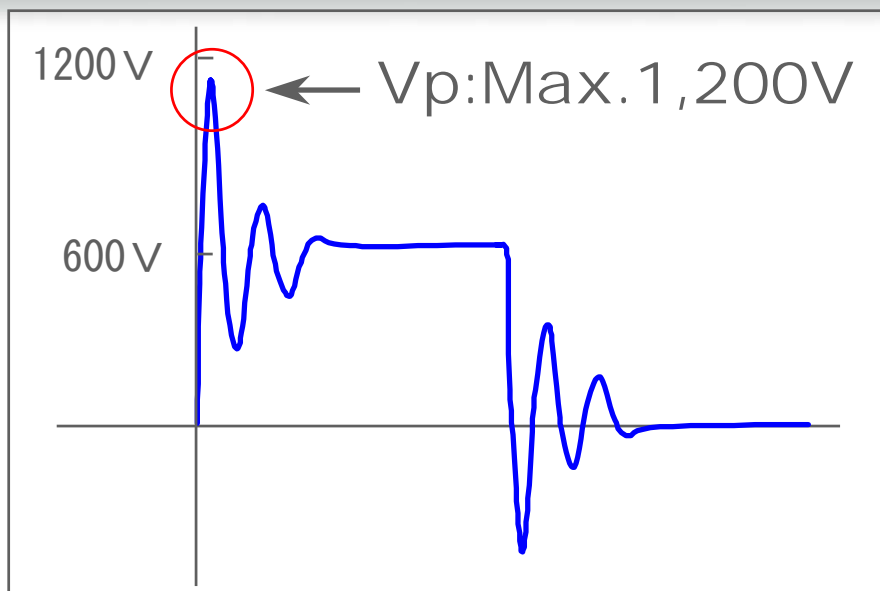
- Reflection wave holds and accumulate on output wave. (Inverter Surge)
- Surge rises in Proportion to that of Pulse

**Enlarge Surge current**



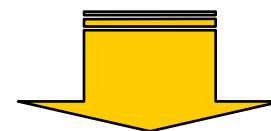
**Insulation must be enforced**

## 2. The bad influence by inverter surge



Wave form of inverter surge (400V gra

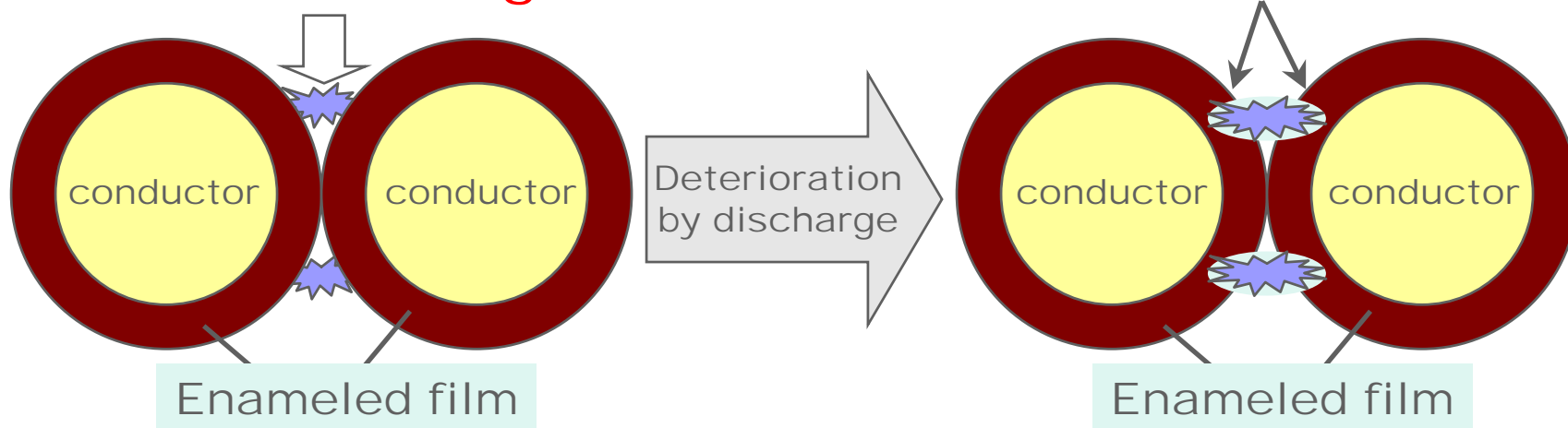
Voltage  
(approx.800V)



Partial discharge  
causes surge  
current

Film erosion incurs the  
break down of insulation

### Partial discharge



### 3. Comparable products

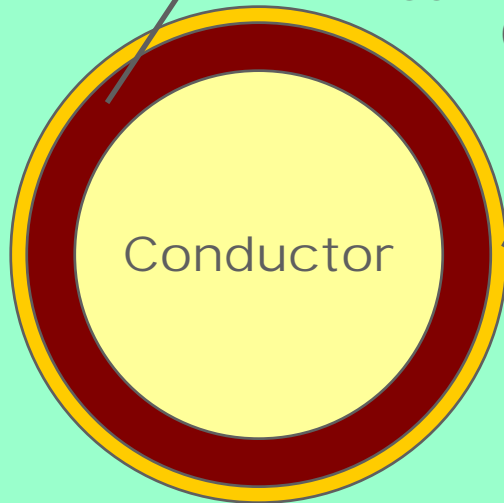
Compound of organic and inorganic material

- Superior performance of Partial discharge
- High performance in anti-scratch

Abrasion of resistant Polyamide-imide film

Partial discharge resistance Polyester-imide

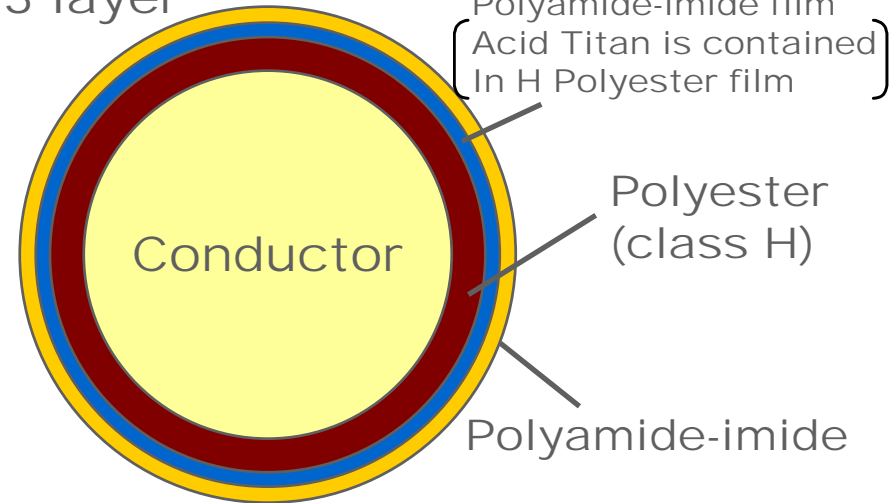
Self-lubricating AIW (KOMAKI)



2 layer

Construction of KMKED-20E

3 layer



Construction of similar Product [T]

# 4. CHARACTERISTICS OF KMKED-20E(0.95φ 1)

Samples		New Product [KMKED-20E]	Conventional Product [T]	General Product [EIW-A(※)]
Items				
Flexibility ( ) 20%elongation (( ))Partial discharge layer		1d good (3d good) <b>((3d good))</b>	1d good (3d good) <b>((8d good))</b>	1d good ( 2d good)
Cut through (°C)		<b>420</b>	366	390
Insulation breakdown Voltage (kV)		<b>11.5</b>	11.8	11.5
Lubricant property (Coefficient of friction)		<b>0.048</b>	0.061	0.055
Resistance for Adherence	Force to Failure (N)	<b>13.7</b>	11.3	12.6
	Film flaying (times of scratch)	<b>351</b>	150	180

※ Self-lubricant Polyamide-imide over-coated  
with Polyester-imide insulation wire

# 5. V-t CHARACTERISTICS OF KMKED-20E(0.95 $\phi$ 1) **HitachiCable**

