

Since 1979

Introduction to **KOC**

Oil Immersed **Transformer**

Customer and Quality are the KOC's first priority

# Oil Immersed Transformers



**KOC ELECTRIC CO., LTD.**





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# Company Information

- ❖ Established Company Since 1979
- ❖ Fully Paid Capital of  
9600 Thousand Dollars(US \$)
- ❖ 200 Employees  
(Head Office & Ulsan Factory)



**KOC ELECTRIC CO., LTD.**  
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❖ **HEAD OFFICE** (BUSAN)

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GLOBAL GREEN COMPANY  
환경경영을 앞서는 기업



# Head Office

## Cast Resin & Dry Transformer



HEAD OFFICE



❖ A PLANT



❖ B PLANT





# Ulsan Factory

## Oil Immersed Transformer



Ulsan factory



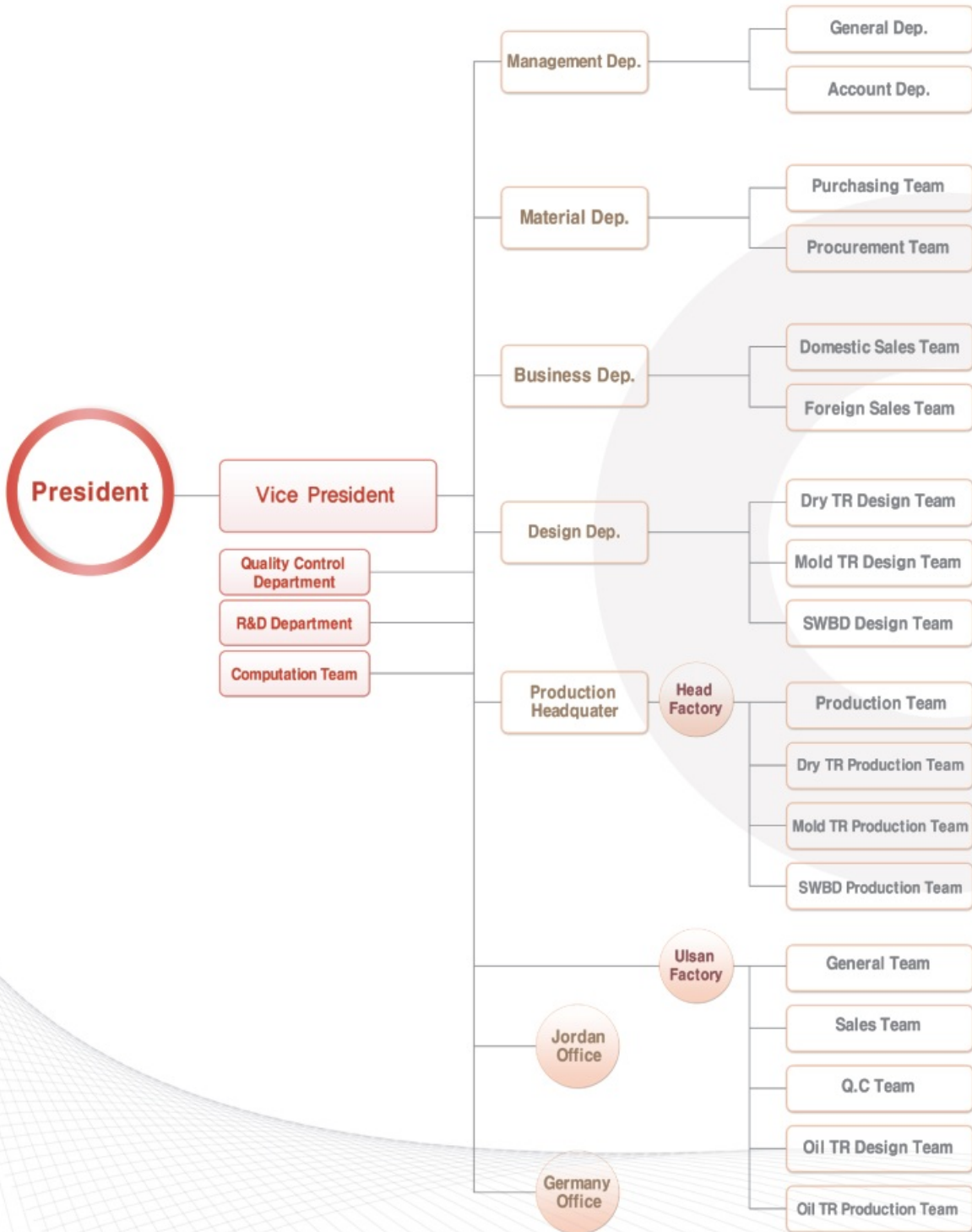
PLANT



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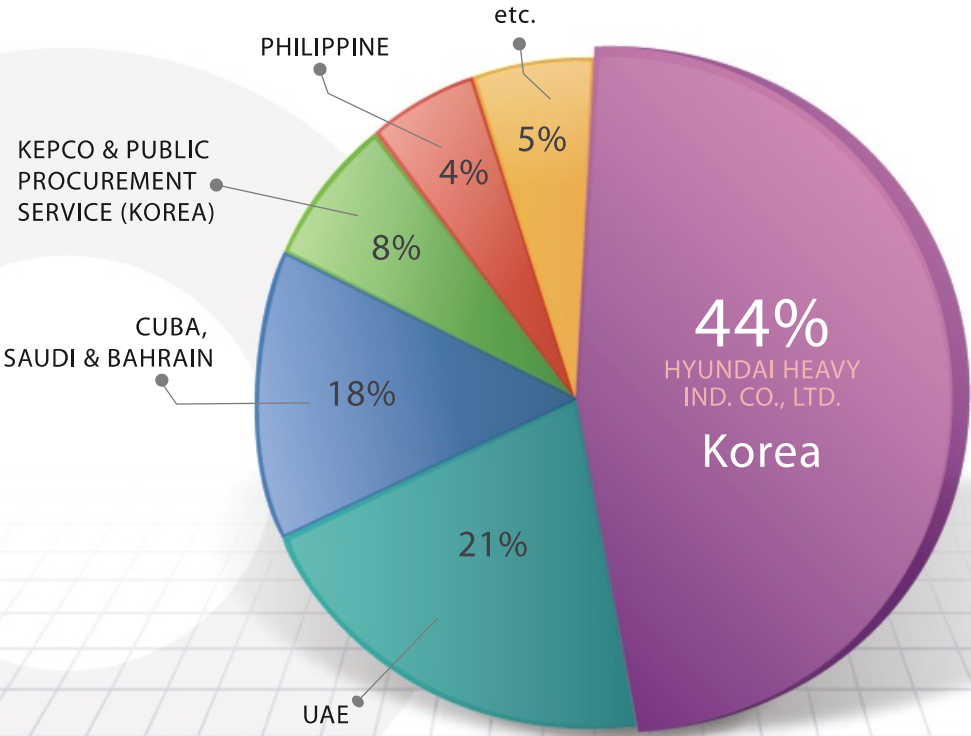


# Organization



# Sales Markets

Annual Production Capacity of 60 Million Dollars (US \$)



- KOREA : 44%
- UAE : 21%
- CUBA, SAUDI & BAHRAIN : 18%
- KEPCO & PUBLIC PROCUREMENT SERVICE (KOREA) : 8%
- PHILIPPINE : 4%
- etc. : 5%

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# Main Customers

## Heavy Industry/ Plant

▪ HYUNDAI HEAVY INDUSTRIES
▪ HANJIN HEAVY INDUSTRIES
▪ SAMSUNG HEAVY INDUSTRIES
▪ DOOSAN HEAVY INDUSTRIES
▪ HYUNDAI E&C
▪ DAEWOO E&C
▪ DAERIM
▪ KCC E&C
▪ LOTTE E&C
▪ POSCO E&C
▪ GS E&C
▪ SK E&C



## Petrochemical, Steel, and Otherwise

▪ HYUNDAI STEEL
▪ POSCO
▪ HYNIX SEMICONDUCTOR
▪ SK ENERGY
▪ HYUNDAI OILBANK
▪ KUMHO PETROCHEMICAL
▪ OCI (DC CHEMICALS)
▪ HANWHA CHEMICAL
▪ KOREA PUBLIC PROCUREMENT
▪ KEPCO
▪ GS CALTEX



# Main Products

## ❖ Oil Immersed Transformers (Capacity Ranges : Up to 80MVA)

- High Quality, Efficiency and Competitive Price
- Qualified Engineers and Skilled Works
- Ability to Withstand High Impulse and Short Circuit Current
- Robust in Design and Low Noise Level
- Effectively Protected Against Corrosion
- Maximum Safety and Low Level of Maintenance



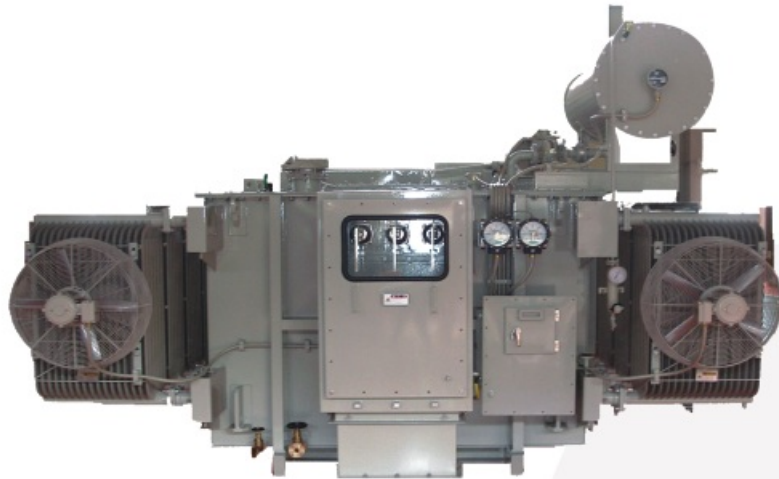
Capacity : 80MVA



Capacity : 25MVA



# Product Ranges



## Oil Immersed Transformers (The Oil Transformers were manufactured by HHI OEM)

- Capacity Ranges : Up to 80MVA
- Rated Voltages : Up to 66kV
- Frequency : 50 or 60Hz,
- Phase : 1PH, 3PH
- Insulation class : "A" Class
- Standards : IEC60076, ANSI C57, NEMA TR1, JEC-204
- %Impedance : 12.5%  
as per IEC60076-5
- Efficiency : 99.5%
- Voltage Regulation : 1.0%
- Sound Level : BELOW 77dB  
(as per NEMA tr-1)
- Insulation Power Factor : BELOW 0.5%





# Application



## Oil Immersed Transformers

- Power Station and Steel Mill
- Industry
- Power Plant and Petrochemical Industry
- Kepco/ Pole Mounted and Pad Mounted tr.
- Special Load Transformer  
(Igbt, Inverter, Furnace Load)



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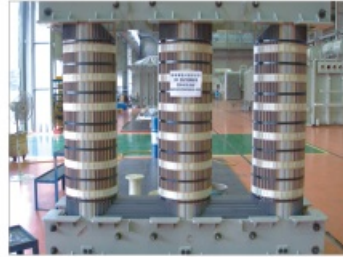


# Manufacturing Process

## Oil Immersed Transformers



Coil Winding



Core Building



Coil & Core Assembly



Dry Oven



Final Assembly



Test & Inspection



Completion

# Perfect Technologies



## Coils

The coils are wound together insulating sheet from copper wire or foil strip according to its rating currents.

This considerably reduces the axial short circuit forces.

The conductor and insulating material are bonded together by heat treatment and form a compact unit which sealed mixed and can also safely withstand radial forces.

## Core

The core is made exclusively of cold-rolled grain-oriented sheet coated with magnesium-silicate-phosphate insulation on both sides.

To fully utilize the grain orientation of the laminations, the ends of the limbs and yokes mitered and stacked together by overlapping the laminations

in pairs, which will reduce the no-load losses and thus the power required for magnetizing the core.





# Advantages of Oil Immersed TR

## ❖ Description

KOC oil immersed transformers are based on the development and research carried out in the design department. This long experience combined with research and development, guarantees high quality, long life and reliability.

## ❖ Standard features

The transformers are manufactured and tested in accordance with the IEC Publication 60076. They are also in compliance with several national standards e.g. NEMA, ANSI, JEC-204 & etc.

## ❖ Construction features

The transformers are of breathing, conventional type provided with an oil conservator. Two types of Transformers are manufactured:

- Transformers with off-load tap changer
- Transformers with on-load tap changer

## ❖ Core

The three legged bolt-less core is constructed of grain oriented steel laminations. The joints between the leg and yoke are mitred at 45° and interleaved. The cross section of the leg is circular.

## ❖ Windings

The material of the windings is either copper or aluminum. The windings are made of paper insulated rectangular wire in the form of multilayer, disc or helical windings.

## ❖ Off-load tap changer

The transformers are normally equipped with a 5-position off-load tap-changer on the cover. When changing the tap position the transformer has to be un-energized.

### ❖ On-load tap changer

The on-load tap-changer is mounted on the cover of the main transformer tank. The tap-changer works as a selector switch and a tap selector. The selector switch is located in a separate oil compartment which is connected to its own conservator.

The on-load tap-changer is provided with a motor drive mechanism for remote and local control.

### ❖ Insulating oil

The mineral oil used in the transformers complies with IEC 296 and several national standards.

### ❖ Tank

The transformer tank is usually of the rigid type provided with removable radiators connected to the tank by means of a shut-off valve.

### ❖ Options and accessories

The transformers are fitted with the following standard accessories

- Bushings
- Oil conservator with oil level indicator
- Filling and drain valves
- Oil sampling device
- Earthing terminals
- Lifting lugs
- Jacking pads (radiator tanks)
- Rating plate
- Silica-gel breather
- Buchholz relay
- Top oil thermometer

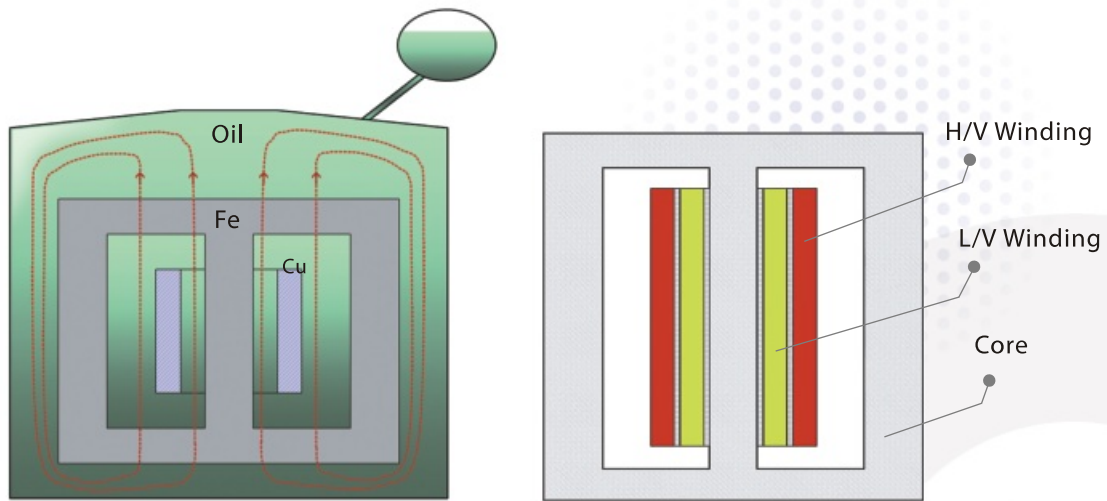
Additional accessories can be fitted in accordance with the customer's specifications.

### ❖ Bushings

The bushings are of a solid porcelain type and located on the cover. Bushing insulators can be changed without opening the transformer. The bushings comply with IEC standard. The terminals can be provided with an air insulated enclosure. The enclosure can be on the primary and/or on the secondary side.



## Scheme of Transformer



Red lines indicate the heat route  
Inside the transformer

Inside the transformer

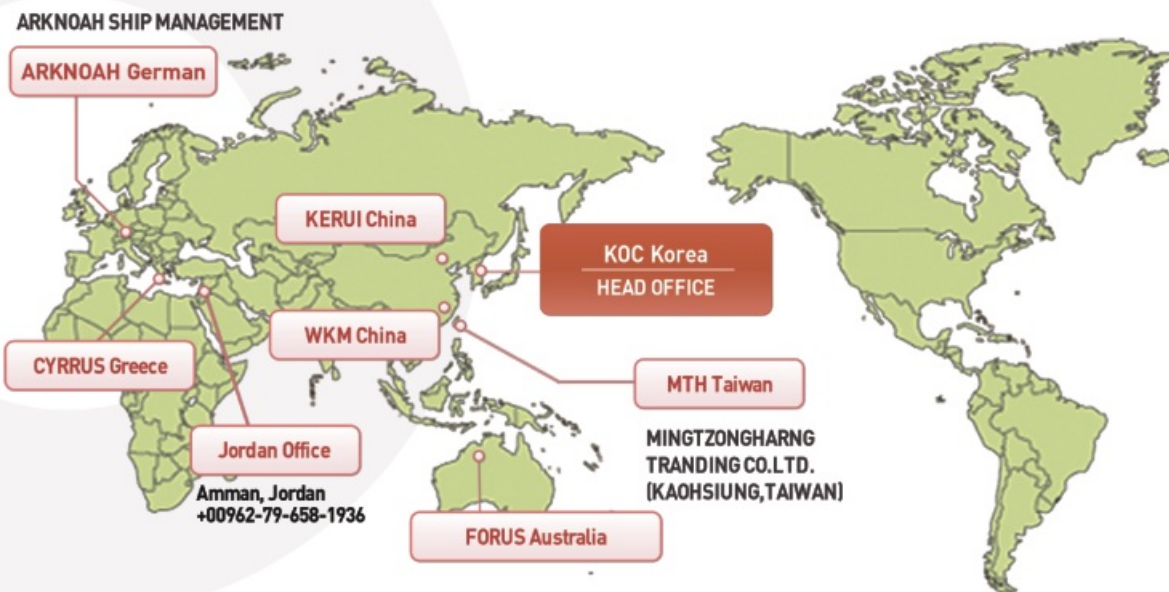
- ❖ In order to good operation the transformer, the heat has to dissipated; for this reason, inside the windings( but for big transformers both core and windings) there are some channels for the passage of cooling fluid.
- ❖ During the electrical transformation job, transformer gets hot and dissipates power in the core causes Hysteresis, and into the core and the winding, for Joule effect



# Warranty & Global Network

Certify of **KOC** products are to be free from defects in material and workmanship under normal use and service for a period of twelve(12) months from date of delivery from KOC, what happens first.

In the event of a failure covered by warranty, **KOC** will undertake to repair or replace the equipment that it is defective and it is returned with all transportation charges prepaid to the KOC. Repairs or replacement under warranty will be made without charge.



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# Quality Assurance & Testing

All transformers are manufactured according to the IEC publication 60076 standard. The transformers are individually tested according to IEC standards and several national standard e.g. NEMA, ANSI, JEC-214 & etc.

Under the slogan of 『Quality First』, we do our best in order to manufacture better product with whole of our KOC staff-members.

## ❖ Routine Tests

- Measurement of winding resistance
- Measurement of voltage ratio and testing of voltage vector relationship
- Measurement of impedance voltage, short-circuit impedance and load loss
- Measurement of on-load loss and current
- Dielectric tests:  
Separate source voltage withstand test  
Induced over voltage withstand test

## ❖ Type Tests

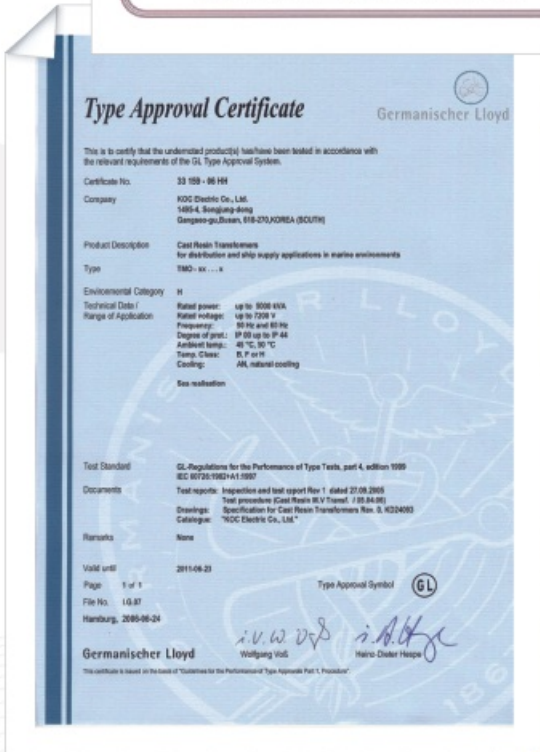
- Temperature rise test
- Lightning impulse test

## ❖ Special Tests

- PD test
- Measurement of zero-sequence impedance on three phase transformers
- Short circuit test
- Measurement of sound level
- Tests on load tap-changer

These tests are carried out in accordance with the relative IEC 60076 STD.

# Quality Certification

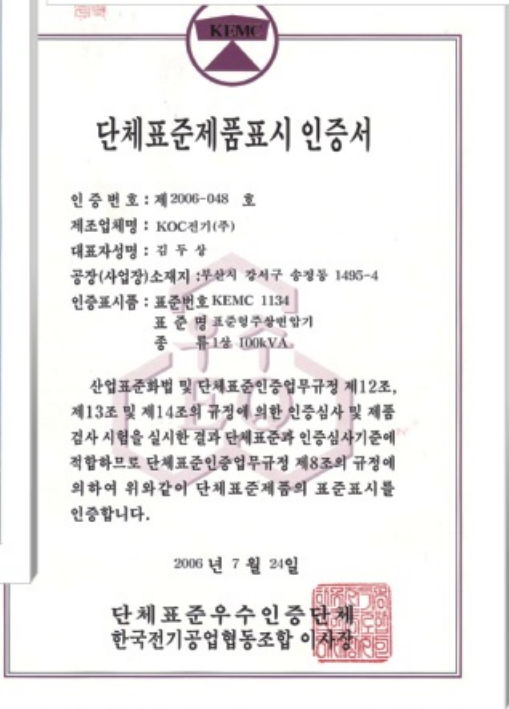


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# Quality Certification



# Reference List / Totally

## Oil immersed Transformers

Update : 2010.03.25

	2004/2005	2006	2007	2008	2009	TOTAL
~ 1MVA	798	3295	2456	1379	37	7965
~ 10MVA	39	130	87	139	72	467
~ 20MVA	5	2	18	8	26	59
~ 40MVA	-	-	11	19	23	53
~ 80MVA	-	-	-	-	4	4
TOTAL	842	3427	2572	1545	162	8548



## Reference List on 2004 / 2005 Years

YEAR	CUSTOMER	COUNTRY	PROJECT	CAPACITY	Q'TY	NOTE
2004	HHI	KOREA	UTILITIES ADMINISTRATION DEP'T	8500kVA / etc.	4	
			STATS CHIPPAK KOREA	1000kVA / etc.	4	
	HEUNG SAN ELEC.	KOREA	TR REPAIR	6000kVA	1	
	HMD	KOREA	C24052	2500kVA	2	
<b>TOTAL</b>					<b>11</b>	

YEAR	CUSTOMER	COUNTRY	PROJECT	CAPACITY	Q'TY	NOTE
2005	GS E&C	OMAN	OMAN POLYPROPYLENE	20MVA	2	
				10MVA	2	
				2000MVA	6	
				BELOW 400kVA	4	
	HYUNDAI MOTORS	INDIA	HMC-INDIA FACTORY	12MVA	1	
	KEPCO	KOREA	POLE TYPE TR	100kVA / etc.	776	
	HHI	KOREA	HYNIX SEMICONDUCTOR / etc.	13kVA / etc.	12	
			KIA MOTORS	3500kVA / etc.	14	
			UTILITIES ADMINISTRATION DEP'T	3000kVA / etc.	6	
HYOSUNG TECH / etc.	KOREA	HYSKO / etc.	160kVA / etc.	8		
<b>TOTAL</b>					<b>831</b>	



## Reference List on 2006 Years

YEAR	CUSTOMER	COUNTRY	PROJECT	CAPACITY	Q'TY	NOTE
2006	HMC	INDIA	HMC/INDIA FACTORY	3000kVA	2	
				BELOW 3000kVA	17	
	DOOSAN HEAVY INDUSTRY	UAE	DUBAI JEBEL ALI-M	1500kVA	10	
				1250kVA	4	
	SAMSUNG ENG.	SAUDI	TASNEE ETHYLENE	5000kVA	2	
				BELOW 5000kVA	20	
	SAMSUNG ENG.	SAUDI	APPC PDH/PP	3150kVA	6	
				BELOW 3150kVA	2	
	HANJIN SC	PHILIPPINE	SUBIC SHIPYARD	20MVA	2	
				2500kVA	20	
				BELOW 2000kVA	38	
	HHI	CUBA	1700KW PACKAGEDPOWER STATION	8.5MVA	3	
	KEPCO	KOREA	POLE TYPE TR	100kVA / etc.	3222	
	KOREA PUBLIC PROCUREMENT SERVICE	KOREA	GU-MI WATER SUPPLY AND DRAINAG	2000kVA / etc.	4	
	HHI	KOREA	HYNIX SEMICONDUCTOR	6.5MVA etc.	9	
KCC, POSCO / etc.			9MVA / etc.	54		
HAJIN SC / etc	KOREA	DADAEO SHIPYARD / etc.	7.5MVA / etc.	12		
<b>TOTAL</b>					<b>3427</b>	



## Reference List on 2007 Year

YEAR	CUSTOMER	COUNTRY	PROJECT	CAPACITY	Q'TY	NOTE
2007	HYUNDAI E&C	SAUDI	KHURAI'S GAS PJT.	20MVA	4	
				10MVA	2	
	SAMSUNG ENG.	SAUDI	IBN ZAHR PP-3	2500kVA	7	
				12.5MVA	4	
	HHI	CUBA	UNE 130MW DPP	8.5MVA	29	
			1700KW PACKAGED POWER STATION	20MVA	1	
	HANJIN SC	PHILIPPINE	SUBIC SHIPYARD	10MVA	1	
	KORYEO INSTRUMENT ELECTRIC	PHILIPPINE		2500kVA	1	
				2000kVA	1	
	KEPCO	KOREA	POLE TYPE TR	100kVA / etc.	2434	
	KOREA PUBLIC PROCUREMENT SERVICE	KOREA	CHANG WON PROVINCE	300kVA / etc.	3	
	HHI	KOREA	HINIX SEMICONDUCTOR	40MVA / etc.	26	
			SAMSUNG ENG. LPC SEG	30MVA / etc.	5	
			HYUNDAI STEEL etc.	25MVA / etc.	47	
DONG NAM / etc.	KOREA	BUSAN APT etc.	5MVA / etc.	7		
<b>TOTAL</b>					<b>2572</b>	

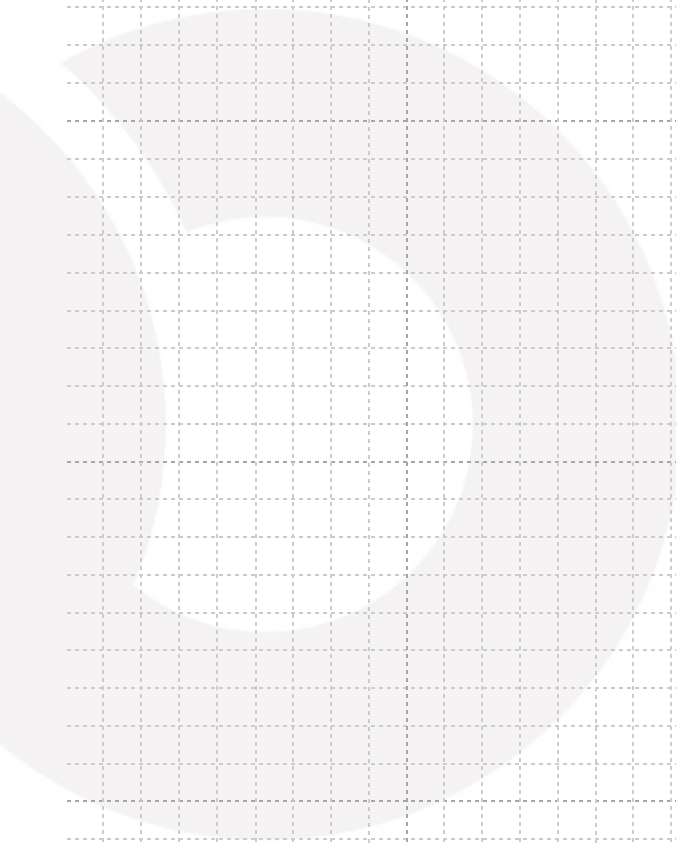
## Reference List on 2008 Years

YEAR	CUSTOMER	COUNTRY	PROJECT	CAPACITY	Q'TY	NOTE
2008	SAMSUNG ENG.	SAUDI	IBN ZAHR OCT	240kVA	1	
	HHI	CHILE	BIOBIO	8.5MVA	5	
		CUBA	UNE 130MW DPP	12.5MVA	1	
				750kVA	12	
			1700KW PACKAGED POWER STATION	8.5MVA	29	
	DOOSAN HEAVY INDUSTRY	UAE	DUBAI JEBEL ALI-M	55MVA	1	
				2500kVA	20	
	HHI	SAUDI	MARAFIQ IWPP	12MVA	8	
				5MVA	2	
				BELOW 5MVA	37	
	GMB E&C	UGANDA	TORORO 20MW HFO POWER	20MVA	1	
				BELOW 20MVA	2	
	KEPCO	KOREA	POLE TYPE TR	100kVA / etc.	1345	
	KOREA PUBLIC PROCUREMENT SERVICE	KOREA	DAESAN FILTRATION PLANT / etc.	1000kVA / etc.	3	
	HHI	KOREA	OCI(DONG YANG STEEL)	40MVA	6	
			HYUNDAI STEEL / etc.	42MVA / etc.	52	
GS CALTEX NO.4			2000kVA / etc.	6		
BUYOUNG / etc.	KOREA	KAPE / etc.	11MVA / etc.	14		
<b>TOTAL</b>					<b>1545</b>	



## Reference List on 2009 Year

YEAR	CUSTOMER	COUNTRY	PROJECT	CAPACITY	Q'TY	NOTE
2009	SAMSUNG ENG.	UAE	SHEWEIHAT S2 IWPP	80kVA	4	
				40MVA	2	
	HHI	UAE	ABUDHABI ENERGY SOLUTION	20MVA	6	
				10kVA	14	
				100MVA	17	
	HHI	BAHRAIN	AL-DUR IWPP	3300MVA	8	
				3000kVA	6	
				2000kVA /etc.	11	
	HHI	CUBA	1700KW PACKAGED POWER STATION	8500kVA	7	
	HHI	IRAQ	MOWR 30MW DPP	900kVA	4	
	HHI	JORDAN	ALQAT-RANA	25MVA	2	
	GMB E&C	UGANDA	TORORO 20MW HFO POWER	20MVA	1	
	HHI	KOREA	OCI(DONG YANG STEEL) KCC P2	40MVA / etc.	10	
			WOONG JIN SILICON HAN KOOK SILICON	50MVA / etc.	10	
			HYUNDAI OIL BANK UTILITY	30MVA / etc.	13	
			HYUNDAI STEEL	35MVA / etc.	38	
KKPC, POSCO / etc.			15MVA / etc.	7		
WIND POWER GENERATION			2000kVA	2		
<b>TOTAL</b>					<b>162</b>	



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