



# Introduction of Huaming



## Who We Are

- A world leader of one-stop voltage regulation solutions
- Around 800 employees
- Produce around 7,000 ~10,000 OLTC per annum
- Headquartered in Shanghai, China



## Main Facilities



**Headquarter**

**Total area of 20 hectares and  
building area of 120,000 sqm.**

**Fengxian Factory**



## HMT (New Factory in Turkey)



**Start operation by end of 2015**  
**Designed Capacity of 2,000 units/year**

# Tap Changer Products Range

One stop solution cover from 10kV to 1000kV application

- ✓ Conventional & Vacuum
- ✓ On-tank & In-tank
- ✓ Liquid immersed, dry type & gas-insulated
- ✓ Automation & monitoring





## Brief History

- 1989 Huaming was founded
- 1990 First OLTC was launched into Market
- 1994 First OLTC for export market
- 2002 First vacuum OLTC
- 2009 OLTC Laboratory accredited
- 2013 First OLTC specially designed for HVDC
- 2014 First OLTC for Gas-insulated transformer
- 2015 Listed in public stock exchange market



## Production Capacity

- 12,000 OLTCs annually in one shift



## Machining Capability

- ◆ 4 CNC machinery workshops
- ◆ Over 90 numerically controlled & CNC machines
- ◆ 80% of components are processed by numerically controlled & CNC machines



## Special Machines

Design and producing special machines in house by engineering team



◆ 3D Driller for tap changer flange

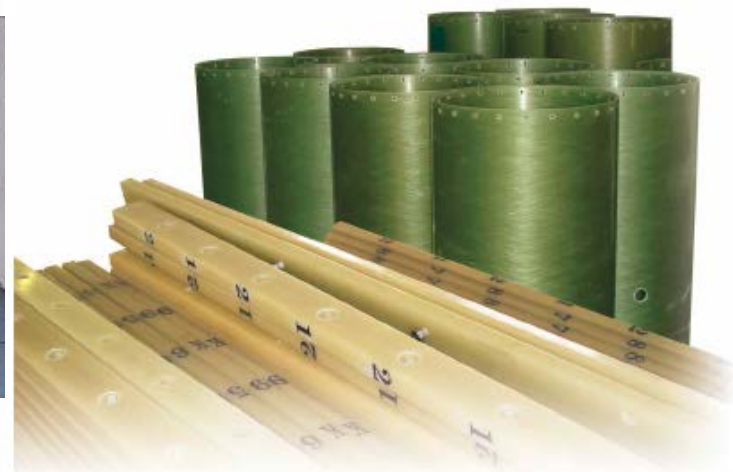


◆ CNC Driller for insulation cylinder

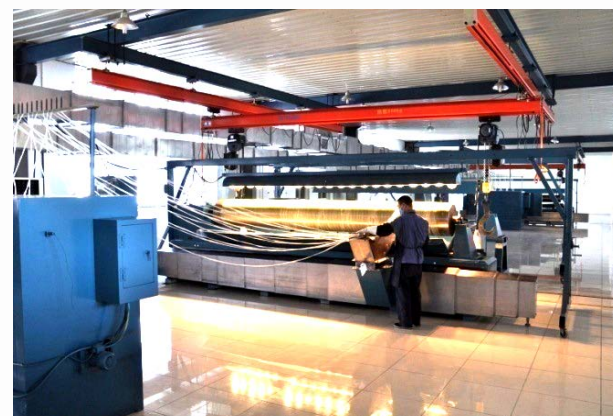
# Epoxy Fiberglass Components Made in House



◆ Pultrusion process



◆ winding process



## SMC Raw Material Formulation



# Metal Casting Process

Following components are made in house

- Die-casting of aluminum-alloy components
- Precision investment casting components



## Molding of SMC & DMC Components

- SMC or DMC material is with good strength and insulating property
- To ensure tap changer having a reliable performance under arcing and high voltage



## Aluminum Sheet Forming



### Compared with Die-casting

- ✓ Less energy consumption
- ✓ Less pollution
- ✓ Less machining
- ✓ Better surface quality

# Contacts



**Powder Metallurgy  
&  
Sintering Process**



- ◆ 3D inspection of the parts



- ◆ Concentricity inspecting for CM OLTC core



- ◆ Measurement of CV moving contacts pressure



- ◆ Inspect the contact pressure of CV2 mechanical contacts



# System Certificate

ISO9001 quality control system has been qualified since 1996

ISO18001

ISO14001

ISO9001



## Routine Test According to IEC60214-1(2014)

### Routine test program

- ◆ Leakage testing of oil chambers
- ◆ 2000 mechanical operations
- ◆ Contact resistance measurement
- ◆ Operating sequence test
- ◆ Rated AC power frequency withstand voltage testing
- ◆ Switching tests for Vacuum OLTC



## Routine Test According to IEC60214-1(2014)

HM to perform switching test as routine test in order to ensure the integrity of vacuum interrupter



**Switching test**

## Tap Changer Testing and Inspection Centre



**Two parallel Switching test lines**



◆ Mechanical test



◆ Dielectric test



◆ Mechanical test from -25 °C to -40 °C



◆ Temperature rise test



◆ Heat & Cold cycle Test



# Huaming Laboratory Accreditation Certificate

Huaming OLTC Laboratory has been approved by CNAS (China National Accreditation Service), Which is the accreditation body member of International Laboratory Accreditation Cooperation (ILAC)

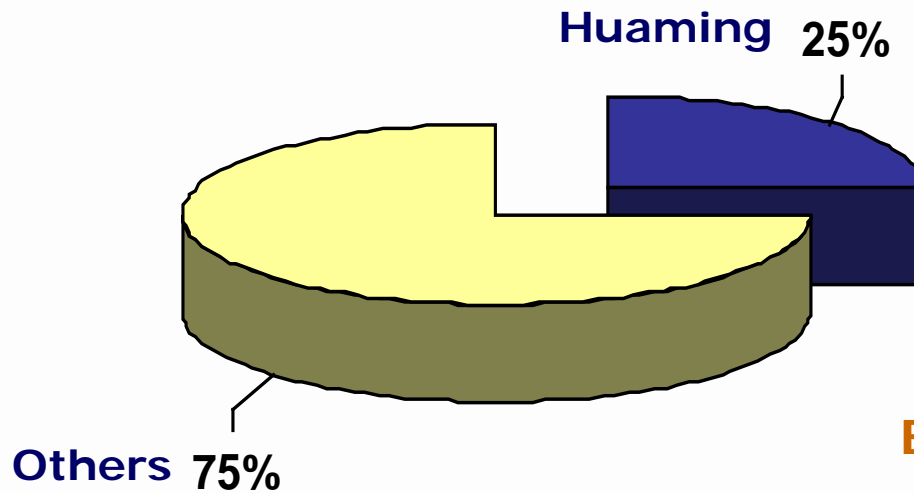
ILAC including around total 136 organizations in 89 countries



- Huaming is the main drafter for Chinese Tap Changer Standard which is equivalent to IEC60214-1(2014)
- Own over 200 OLTC and OCTC patents



## Huaming Worldwide Market Share



**By sales quantity**

**One of the biggest TAP  
CHANGER manufacturer  
in the world**



# Providing Tap Changers to over 100 Countries



## Asia

### America

Argentina  
Brazil  
Canada  
Chile  
Cuba  
Ecuador  
Guatemala  
Guyana  
Mexico  
Nicaragua  
U.S.A.  
Trinidad & Tobago  
Uruguay  
Panama

### Oman

Afghanistan  
Azerbaijan  
Bangladesh  
Bhutan  
Burma  
Cambodia  
DPRK  
India  
Indonesia  
Iran  
Iraq  
Japan  
Kazakhstan  
Kirghizia  
Kyrgyzstan  
Korea

### Laos

Malaysia  
Mongolia  
Nepal  
Pakistan  
Philippines  
Saudi Arabia  
Sri Lanka  
Syria  
Tajikistan  
Thailand  
Turkmenistan  
Uzbekistan  
Vietnam  
Yemen  
U.A.E.

### Africa

Algeria  
Angola  
Burundi  
Cameron  
Congo  
Cote d' Ivoire  
Ethiopia  
Egypt  
Equatorial  
Guinea  
Ghana  
Kenya  
Lesotho  
Libya  
Madagascar  
Malawi  
Nigeria  
Niger  
Rwanda  
Senegal  
South Africa  
Sudan  
Tanzania  
Tunisia  
Ugandan  
Zambia  
Zimbabwe

### Europe

Albania  
Austria  
Belgium  
Belorussia  
Czech Republic  
Estonia  
Finland  
France  
Germany  
Greece  
Italy  
Iceland  
Norway  
Poland  
Portugal  
Romania  
Russia  
Slovenia  
Slovak Republic  
Spain  
Sweden  
Turkey  
Ukraine  
Oceania  
Australia  
New Zealand  
Papua New Guinea



## Worldwide Customers

### ABB

ABB AG (Brilon, Germany)  
ABB ZARAGOZA (Spain)  
ABB Bilbao (Spain)  
ABB Monselice (Italy)  
ABB Sp. z.o.o. (Poland)  
ABB (Thailand)  
ABB (Korea)  
ABB Transformer Co., Ltd. (Vietnam)  
ABB Transformer Co., Ltd. (Shanghai, China)  
ABB Transformer Co., Ltd. (Hefei, China)  
ABB Transformer Co., Ltd. (Chongqing, China)  
ABB Transformer Co., Ltd. (Zhongshan, China)

### ALSTOM

ALSTOM Brazil  
ALSTOM Germany  
ALSTOM Indonesia  
ALSTOM Turkey  
ALSTOM Shanghai (China)  
ALSTOM Wuhan (China)  
ALSTOM Australia



## Worldwide Customers

### Siemens

Siemens AG (Dresden, Germany)  
Siemens (Italy)  
Siemens Manufacturing (Colombia)  
Siemens Ltd. (India)  
Siemens Engineering (Pakistan)  
Siemens (Russia)  
Siemens Transformer Co.,Ltd (Jinan, China)  
Siemens Transformer Co.,Ltd (Guangzhou, China)  
Siemens Transformer Co.,Ltd (Wuhan, China)

### Schneider

Schneider France  
Schneider Indonesia  
Schneider Turkey

### CG

CG Power Systems Belgium NV  
CG Electric Systems Hungary Zrt.  
PT.CG POWER SYSTEMS INDONESIA

### France

JST Transformers  
TSV Transformateurs Solutions

### Switzerland

Trasfo A. S.



## Worldwide Customers

**Portugal**

**EFACEC**

**Italy**

**Bticino (LEGRAND  
Elettromeccanica Tironi s.r.l  
GBE S.p.A.  
GETRA S.p.A  
TAMINI  
TES Transformer Electro Service S.r.l.**

**Poland**

**ZREW A. S.**

**Czech**

**ETD TRANSFORMÁTOR, A.S**

**Slovenia**

**KOLEKTOR ETRA D.O.O**

**Russia**

**Energomash (UK) LTD.CO  
TOGLIATTI TRANSFORMATOR  
SVEL  
NPK Eletrical Machines**

**Kazakhstan**

**AO «Kantau Transformer Plant»**

**Azerbaijan**

**J-S Co." BAKU TRANSFORMER Factory"**

**Uzbekistan**

**JSC "Chirchik Transformator Plant"**



## Worldwide Customers

<b>Turkey</b>	<b>Balikesir Elektromekanik Sanayi Tesisleri A.S.</b>
<b>Australia</b>	<b>Wilson Transformer</b>
<b>Korea</b>	<b>Hyosung Corporation HYUNDAI Heavy Industries Co.,Ltd</b>
<b>India</b>	<b>EMCO.LTD. TRANSFORMERS &amp; RECTIFIERS (I) LTD. Voltamp Transformer Ltd VIJAI ELECTRICALS LTD.</b>
<b>Indonesia</b>	<b>PT TRAFIINDO PRIMA PERKASA</b>
<b>Bangladesh</b>	<b>Energypac Engineering Ltd</b>
<b>Thailand</b>	<b>Tira Thai Co.,Ltd FUJI TUSCO CO.,LTD.</b>



## Worldwide Customers

<b>USA</b>	General Electric (Shreveport) General Electric (Salem)
<b>Mexico</b>	GE Prolec WEG TRANSFORMADORES MEXICO, S.A.DE C.V.
<b>Canada</b>	PARTNER TECHNOLOGIES INCORPORATED
<b>Brazil</b>	Comtrafo SA TRAFO Equipamentos Elétricos SA WEG Indústrias S.A. – Transformadores
<b>Chile</b>	RHONA S.A.
<b>Argentina</b>	Los Conce SA
<b>Uruguay</b>	URUTANSFOR S.A
<b>China</b>	Baoding Tianwei Transformer Group China XD Group JSHP Transformer Co.,Ltd TBEA Transformer Group



## Project in China

**500kV Wuyi substation**  
**Hebei Electric Power Corporation, SGCC**  
**Baoding Tianwei Transformer:**  
**250MVA/500kV**  
**OLTC: CMDI-2400/252D-10193W**



**DA QIN Railway Substations**  
**China XD Group Transformer:**  
**80MVA/55kV & 75MVA/55kV**  
**VACUUM OLTC:**  
**SHZVI-1600/72.5C-10090**



## Project in Shanghai

### Shanghai World Financial Center

8 units of vacuum CVT for  
JSHP 10kV dry transformers with  
capacity up to 2500kVA





## Project in Asia

For Switchyard 157 KV PLTU Rembang Surabaya,

End user: PLN / Indonesia

AREVA Transformer: 375MVA/157kV

OLTC: 3×CMDI 2400/72.5C-10193W



TETUAN HARTALEGA SDN. BHD/ Malaysia

Sanil/Korea transformer: 20MVA/33kV

OLTC: CVIII-350D/72.5-10193W



**NGCP, Philippines**  
**Siemens/Alstom Transformers:**  
**100MVA/138kV(+8-12)x1%**  
**OLTC: 3xCMI-600/126C-12233W**

**Bac Ninh 220kV substation**  
**SPPMB, Vietnam.**

**TEBA Shenyang transformer:**  
**OSFSZ-250MVA/220kV $\pm$ 8 $\times$ 1.25%TH**  
**OLTC: 3XCMI-1200/170D-10191W**



## Project in Asia

**500kV Power Substation in Tajikistan**

**User: The Open Joint Stock Company**

**TBEA Transformer:  $3 \times 167\text{MVA}, 525/230/36\text{kV}$**

**OLTC: CMDI-2400/252D-10193W**



**CMD DIVERTER  
SWITCH**



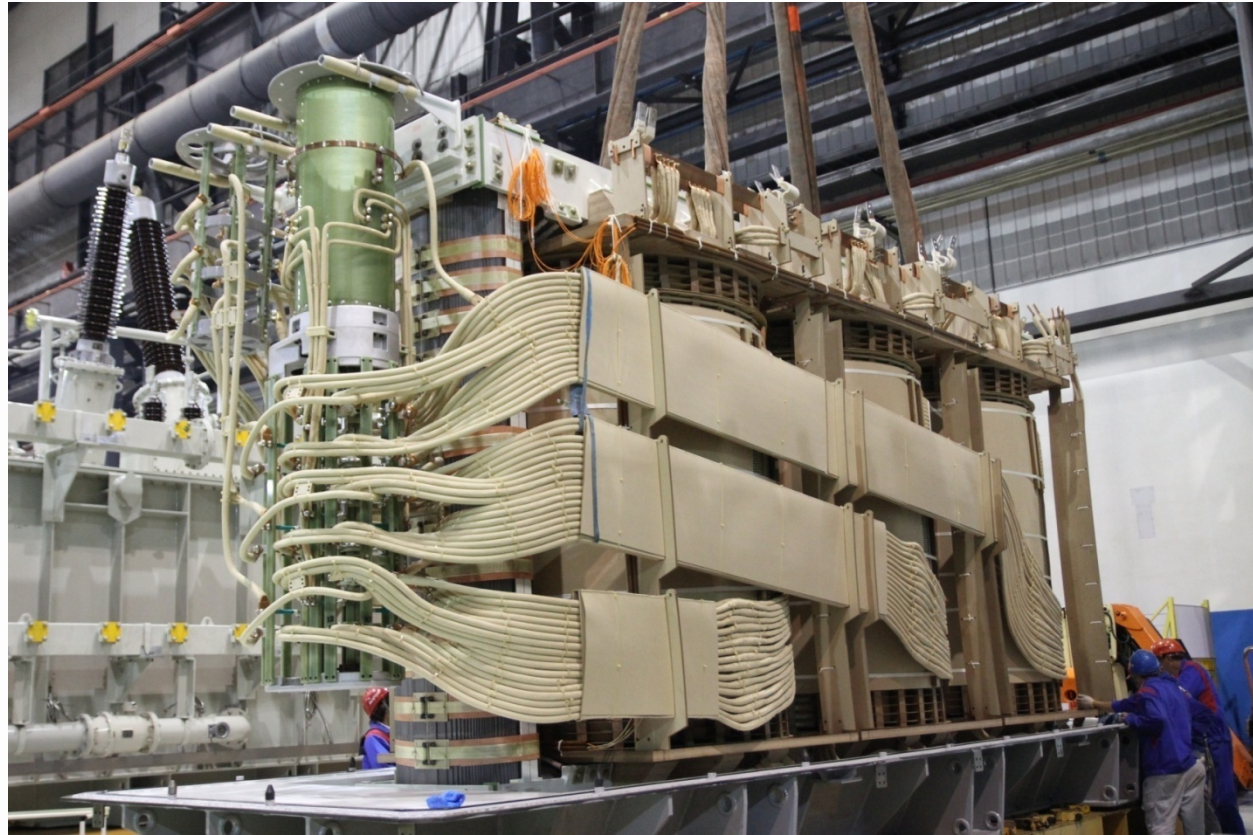
**For Syria Power utility**

**Transformer:**

**SFZ-30/66 $\pm$ 9 $\times$ 1.778%**

**OLTC: SVIII-500Y/72.5-10191W**

## Project in America



**Project: Desert Sunlight**  
**Alstom Transformer: 335MVA/230kV**  
**OLTC: CMDIII-1000Y/72.5C-18353W**  
**& WSLIV-1000D/72.5-6X5(B)**

## Project in Mexico



**User:**  
**Acciona Wind Energy USA Llc**  
**GE Prolec Transformer: 125MVA/230kV**  
**OLTC: CMI II-500Y/72.5C-18353W**

**User: Techint S.A. de C.V./CFE**

**GE Prolec Transformer: 140MVA/400kV**

**OLTC: CMI -800/220D-12233WR**



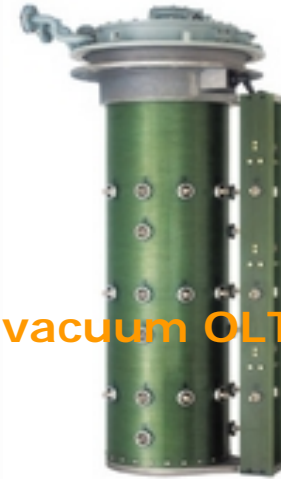
## Project in Canada

User: SaskPower

Partner Technologies Incorporated

Transformer: 10MVA/24.94kV

OLTC: CV2III-350D/40.5-12231W



CV2 vacuum OLTC



## Project in Brazil

User: CELG DISTRIBUIDORA ENERGIA

WEG Equip. Elétricos S/A.

Transformer: 35.5MVA/230kV

OLTC: CMI II-350/72.5C-14131W



User: ELETRONORTE

ALSTOM GRID ENERGIA LTDA

Transformer: 100MVA/138kV

OLTC: 3xSHZVI-800Y/170C-10193W



## Project in Brazil

**User: ELEC NOR DO BRASIL-  
COPEL substation in Cascavel  
Transformer: 150MVA/220kV  
OLTC: 3x CMI -800/170C-18353W**



## Project in Brazil

Power dry type transformer

Client : ABB Spain

Project name : Stadium Fontenova



**Vacuum**

**3×CZI-500/72.5-17**

**ABB dry transformer  
25MVA/66kV**

Stadium Fontenova (Salvador, Brazil)

One of main stadiums of FIFA World Cup 2014

## Project in Russia

User: Irkutsk Power Company

SLMTEE Transformer: 125MVA/220kV

OLTC: CM type



## Project in Turkey



- **380kV Power Substation**
- **User: TEIAS**
- **Alstom Turkey and BEST Transformer:  
250MVA,380kV/158kV**
- **OLTC:  
CMDIII-1000/126D-10183W  
SHZVIII-800/126D-10183W**

## Project in Africa

For substation of PHCN/Nigeria-  
Power Holding Company of Nigeria Plc  
AREVA Transformer: 300MVA/330kV  
OLTC: 3×CMI-800/170D-10193GR



**CM DIVERTER SWITCH**



User: KPLC/Kenya  
Sanbian Transformer: 45MVA, 66kV  
OLTC: CV2III-500D/72.5-10193W

## Project in Ivory Coast



**Alstom Turkey Variable shunt reactor:  
40MVA/225kV**

**Vacuum OLTC:  
3×SHZVI-400/126D-12233G**

## Project in Europe

- Special innovative project in offshore platform in North Sea of Scandinavia (Europe)
- EPC : WARTSILA Finland and Norway
- Project name : TYRIHANS
- Final Customer : STATOIL Norway



**Vacuum**

**3×CZI-500/40.5-13**

**EDM dry transformer  
13MVA/23.4kV**



**Oil CVIII-350D/35-10191W**

**TES voltage regulator  
13MVA/10.1kV**

## Project in Italy

User: TERNA  
GETRA and  
CG Hungary Transformer:  
250MVA,400kV/155kV  
Vacuum OLTC:  
SHZVIII-1000/126C-12111W  
(25 units on network)

User: ENEL  
GETRA Transformer:  
40MVA/132kV  
Vacuum OLTC:  
CM2III-500Y/126B-14273W  
(21 units on network)

Short-circuit tests at CESI  
Lab (2010-2011)



Enel Distribuzione Substation TREIA  
(MC) - Region MARCHE, Province  
MACERATA, Italy

## Projects in Spain

User: ENDESA (Osario, Arjona Substation)  
ABB Zaragoza Transformer  
31.5MVA, 66kV +/-8 steps  
3XCZI-500/72.5-17 (4 units)  
Dry type transformer  
(1st 66kV level dry OLTC used on network  
in the world)

User: ENDESA (Substation in Andalucia)  
GETRA Transformer  
125MVA/132kV +/-13 steps  
Vacuum OLTC:  
CM2III-500Y/126D-14271W (4 units)  
Oil-immersed transformer  
Short-circuit test at CESI lab)



The leading distribution  
network in Spain

## Project in Sweden & Finland



**Project: Nordbalt DC Power Cable connecting Sweden and Lithuania by ABB Sweden**

**Transformer: 2 MVA/20kV  
3XCZI 500/40.5-9 (ABB Zaragoza)  
(2 units)**

**End user: Järvi-Suomen Energia, Finland  
Substation: Kulennoinen  
Transformer: 10 MVA/115kV  
CM OLTC**





## Projects in PORTUGAL & POLAND

User: REN Portugal  
EFACEC Transformer 170MVA, 220kV  
CMDIII-1000Y/72.5C-14271W (2 units)  
Oil-immersed transformer

End User: REN Portugal  
Alstom Shunt Reactor:  
188.89 MVA/420kV  
Off-Load Tap Changer: WSL  
IV600Y/170-5\*4E



Redes Energeticas  
Nacionais (National  
Network of Portugal)



User: PSE Poland  
20MVA, 16.5kV  
WSL IV 600Y/72.5-6X5A  
(40 units on network)



## Project in Czech Republic & Latvia



Transformer: 40MVA/110kV  
OLTC: CVIII-350Y/72.5-10193G  
CEZ Distribuce, a.s./Czech Republic  
(National distribution network )

More than 50 units on network

End user: LATVENERGO Latvia National Grid  
Substation: Riga  
Transformer: 25 MVA/115kV  
CMIII500Y/126B-12231W with ETD  
transformer





## Project in Slovakian Republic



End user: E.ON Slovakia  
Transformer: 40 MVA/110kV  
CVIII-350Y/72.5-10193G  
(2 units)

Transformer: 40MVA/110kV  
OLTC: CVIII-350Y/72.5-10193W  
SSE Stredoslovenská energetika  
(National distribution network )  
Zilina Substation  
(2 units)



**SNCF France**  
**CG Belgium transformer**  
**30MVA, 230kV +/-4 steps**  
**WDL V-600/252-8X7B (2 units)**

**Romanian Railway Company**  
**MACE Italy transformer**  
**16MVA, 110kV +/-9 steps**  
**CM I-500/126D-10191W (6 units)**  
**(Short-circuit test at CESI lab 2014)**

**Slovenian Railway Company**  
**ETRA Slovenia Transformer**  
**3.6MVA, 21kV +/-4 steps**  
**CVIII-350D/40.5-10090 (8 units)**



**French Railway**



**Compania Națională de  
Căi Ferate CFR SA**  
**(Romanian Railway)**



**Slovenske železnice**  
**(Slovenia Railway)**



## CERTIFICATION

Awarded to

Mr. SYED MOHSIN RAZA GILLANI

IESCO, Pakistan

This is to certify that above person participated in a training course on Huaming on-load tap changers type below from 2<sup>nd</sup> December to 6<sup>th</sup> December, 2013

Training program includes following tap changers and motor drive units

Oil-immersed OLTCs type CM, CV

Vacuum OLTC type CV2

Motor drive units type CMA7

Mr. Xiao Yi

CEO

Shanghai Huaming Power Equipment Co., Ltd

Date: 6<sup>th</sup> Dec, 2013

Certificate No. 13025

To check the validity of this certificate please call +86 21 5270 2715

Provide Training & Certification on regular maintenance & trouble shooting

## OLTC Maintenance Criteria

### For Conventional OLTC

- Check & maintain oil quality on yearly basis
- Overhaul maintenance every 7~8 years or 60,000 ~80,000 operations

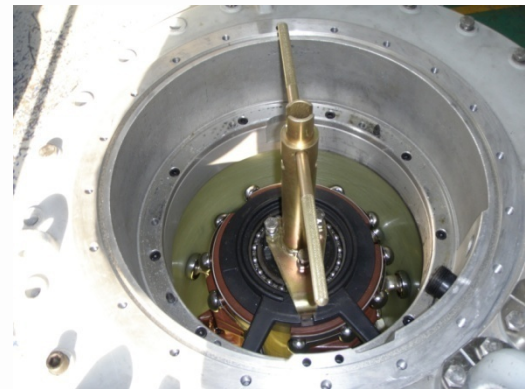
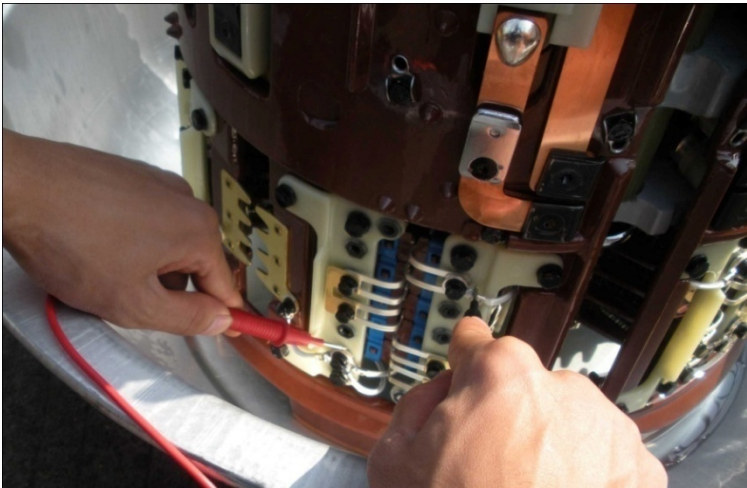
- ✓ lift out active part for cleaning
- ✓ Change contacts(after 200,000 operations), flexible leads & other wearable parts
- ✓ Measurement & test

### For Vacuum OLTC

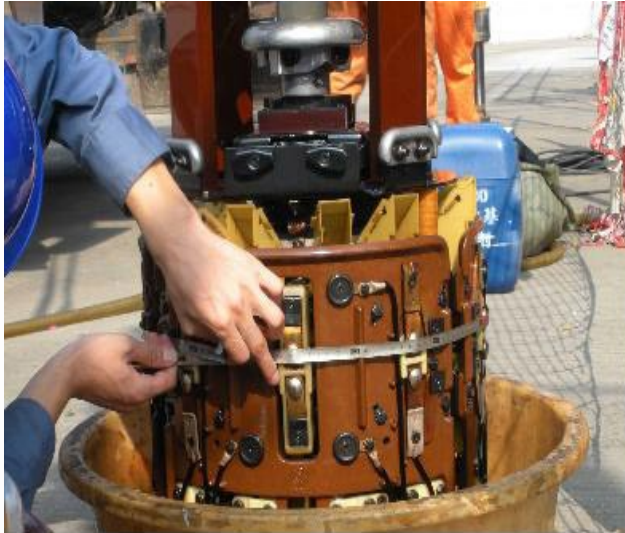
- Check & maintain oil quality on yearly basis
- General inspection every 10 years or 300,000 operations

- ✓ lift out active part for inspection
- ✓ Change contacts, flexible leads & other wearable parts(after 600,000 operations)
- ✓ Measurement & test

# OLTC Regular Maintenance

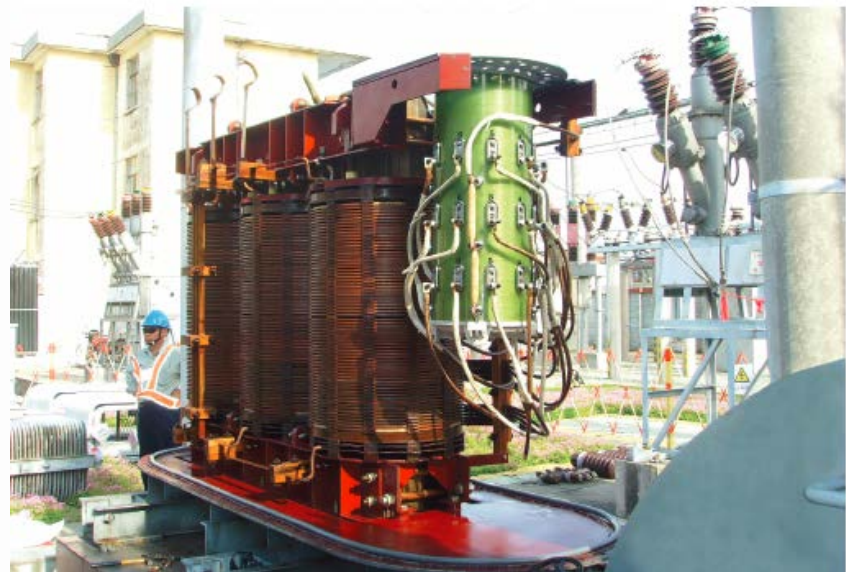


## OLTC Retrofit Project



Conventional to vacuum tap changer

Off-circuit to On-load Tap Changer



## Worldwide Technical & Service Support



**Service Centers in China, Indonesia,  
Brazil, Argentina, Russia, Turkey, UAE,  
South Africa, Czech, France etc.**



# TAP CHANGER RANGE

## On-Load Tap Changer

### Liquid Immersed

#### On Tank

Resistive Type HWV

#### In Tank

Arcing in Oil  
Type SY CV, CM, CMD

Arcing in Vacuum  
Type CV2, CM2, SHZV

Air Insulated  
Type CVT & CZ

Gas Insulated  
Type SHGV

## CM Oil-Immersed OLTC



Category	Oil type, mounted in tank
Max. rated through-current	3-phase:500A、 600A, 1-phase:500A、 600A 、 800A、 1200A、 1500A
Connection application	3-phase for neutral point 1-phase for any connection
Max. Step voltage	3300V
Max. rated switching capacity	3-phase: 1500kVA 1-phase: 3500kVA
Rated frequency	50 or 60 Hz
Operating positions	Without change-over selector :Max.18 With change-over selector: Max.35
Highest voltage for equipment Um	252kV
Motor drive unit model	CMA7, SHM-D

# Special CM Oil-Immersed OLTC



**Multi-coarse CM**

**Max. Operation position:  
107**



**CM linear regulation**

**Max. operation  
position:34**

**For rectification transformer and furnace transformer**

## CMD Oil-Immersed OLTC



Category	Oil type, mounted in tank
Max. rated through-current	3-phase:400A、 600A, 1000A 1-phase:400A、 600A 、 1000A、 1600A、 2400A
Connection application	3-phase for neutral point 1-phase for any connection
Max. step voltage	3300V/4000V
Max. rated switching capacity	3-phase :3000kVA 1-phase: 5600kVA
Rated frequency	50 or 60 Hz
Operating positions	Without change-over selector :Max.18 With change-over selector: Max.35
Highest voltage for equipment Um	252kV
Motor drive unit model	CMA7, SHM-D

## CV Oil-Immersed OLTC



Category	Oil type, mounted in tank
Max. rated through-current	3-phase: 350A、 500A, 1-phase: 350A、 500A、 700A
Connection application	Y for neutral point, D and single phase for any selectable winding
Max. step voltage	1500V
Max. rated switching capacity	3-phase: 525 kVA 1-phase: 660 kVA
Rated frequency	50 or 60 Hz
Operating positions	Without change-over selector :Max.14 With change-over selector: Max.27
Highest voltage for equipment Um	72.5kV
Motor drive unit model	CMA7, SHM-D

## SHZV Vacuum OLTC



Category	Vacuum type, mounted in tank
Max. rated through-current	3-phase:400A、 600A, 800A,1000A 1-phase:400A、 600A 、 1200A、 1500A 、 2000A, 2400A
Connection application	3-phase for neutral point 1-phase for any connection
Max. step voltage	4000V
Max. rated switching capacity	3-phase :2500kVA 1-phase: 4500kVA
Rated frequency	50 or 60 Hz
Operating positions	Without change-over selector :Max.18 With change-over selector: Max.35
Highest voltage for equipment $U_m$	252kV
Motor drive unit model	CMA7, SHM-D

## CV2 Vacuum OLTC



Category	Vacuum type, mounted in tank
Max. rated through-current	3-phase: 350A、500A
Connection application	Single & 3-phase D for any connection
Max. step voltage	1500V
Max. rated switching capacity	525 kVA
Rated frequency	50 or 60 Hz
Operating positions	Without change-over selector :Max.12 With change-over selector: Max.23
Highest voltage for equipment Um	145kV
Motor drive unit model	CMA7, SHM-D

## CM2 Vacuum OLTC

Overall dimension is the same as CM



Category	Oil type, mounted in tank
Max. rated through-current	3-phase:500A、 600A, 1-phase:500A、 600A 、 800A、 1200A、 1500A
Connection application	3-phase for neutral point 1-phase for any connection
Max. Step voltage	3300V
Max. rated switching capacity	3-phase: 1500kVA 1-phase: 3500kVA
Rated frequency	50 or 60 Hz
Operating positions	Without change-over selector :Max.18 With change-over selector: Max.35
Highest voltage for equipment Um	252kV
Motor drive unit model	CMA7, SHM-D

## Dry Type CZ Vacuum OLTC



Category	Vacuum type for dry transformer
Max. rated through-current	500A
Connection application	3 of single units operated by MDU for any selectable winding connection
Max. step voltage	900V
Max. rated switching capacity	250 kVA
Rated frequency	50 or 60 Hz
Operating positions	17 (without change-over selector)
Highest voltage for equipment $U_m$	72.5kV
Motor drive unit model	CMA7, SHM-D

## Dry Type CVT Vacuum OLTC



Category	Vacuum type for dry transformer
Max. rated through-current	3-phase: 160A (Special design 200A)
Connection application	Y for neutral point, D for any selectable winding connection
Max. step voltage	500V
Max. rated switching capacity	80 kVA
Rated frequency	50 or 60 Hz
Operating positions	9 (without change-over selector) 13 (Under development)
Highest voltage for equipment $U_m$	12kV
Equipped with AVR	HMJK-10Z

# SHGV Gas Insulated Vacuum OLTC





Category	Vacuum type for Gas Insulated Transformer
Max. rated through-current	3-phase: 400A
Connection application	Y for neutral point, D for any selectable winding connection
Max. step voltage	4,000V
Max. rated switching capacity	1,200 kVA
Rated frequency	50 or 60 Hz
Operating positions	27
Highest voltage for equipment $U_m$	126
Motor drive unit model	CMA7, SHM-D

## WSL/WDL Off-Circuit Tap Changer



Application	Oil immersed power, rectification, furnace and traction transformers	
Phase	Three-phase WSL	Single-phase WDL
Max. rated through current	3000A	3000A
Highest voltage for equipment $U_m$	126kV	252kV
Connection	reversing, linear, single bridging, star – delta, double bridging, series- parallel	
2) Max. operating positions	11	11
Driving model	Hand wheel operate on the top Manual drive unit on side Motor drive unit on side	
Remark: Special design is possible according to requirement		

## WDG/WSG/WLG Off-circuit tap changers

Application	Oil immersed power, rectification, furnace and traction transformers		
Phase	1-phase WDG(B)	1+2 phase WDG(A)+WLG(A)	Three-phase WSG (C)
Pictures			
Max. rated through current	2000A	2000A	1600A
Highest voltage for equipment Um	252kV	126kV	126kV
Max. operating positions	5	7	7
Driving model	Manual operate on the top or on side, motor drive unit on side		

## Conventional Motor Drive Unit



**CMA7**

Type		CMA7	
Motor	Rated power (W)	750	1100
	Rated voltage (V)	380/3AC	380/3AC
	Rated current (A)	2.0	2.8
	Frequency (Hz)	50/60	50/60
	Rotating speed (r/min)	1400	1400
Rated torque on drive shaft (N·m)		18	26
Revolution of drive shaft per switching operation		33	33
Revolution of hand crank per switching operation		33	33
Running time per switching positions (S)		About 5	
Equipped remote position indicator		HMC-3C	
Equipped AVR		ET-SZ6	
Remark: single phase and DC motor are available per request. Voltages of motor is according to requirement also.			



**Hm**

# HM's 3<sup>rd</sup> generation MDU SHM-D



- **Multi-Com protocols**
- **Multi-physical interfaces**
- **Multi-devices parallel**
- **Auto-Regulation**
- **Modular signal output modules**
- **Connect with other IDE devices**

**SHM-D Motor Drive Unit**



## *Modular Intelligent Controller*

– Provide you easy operation experience

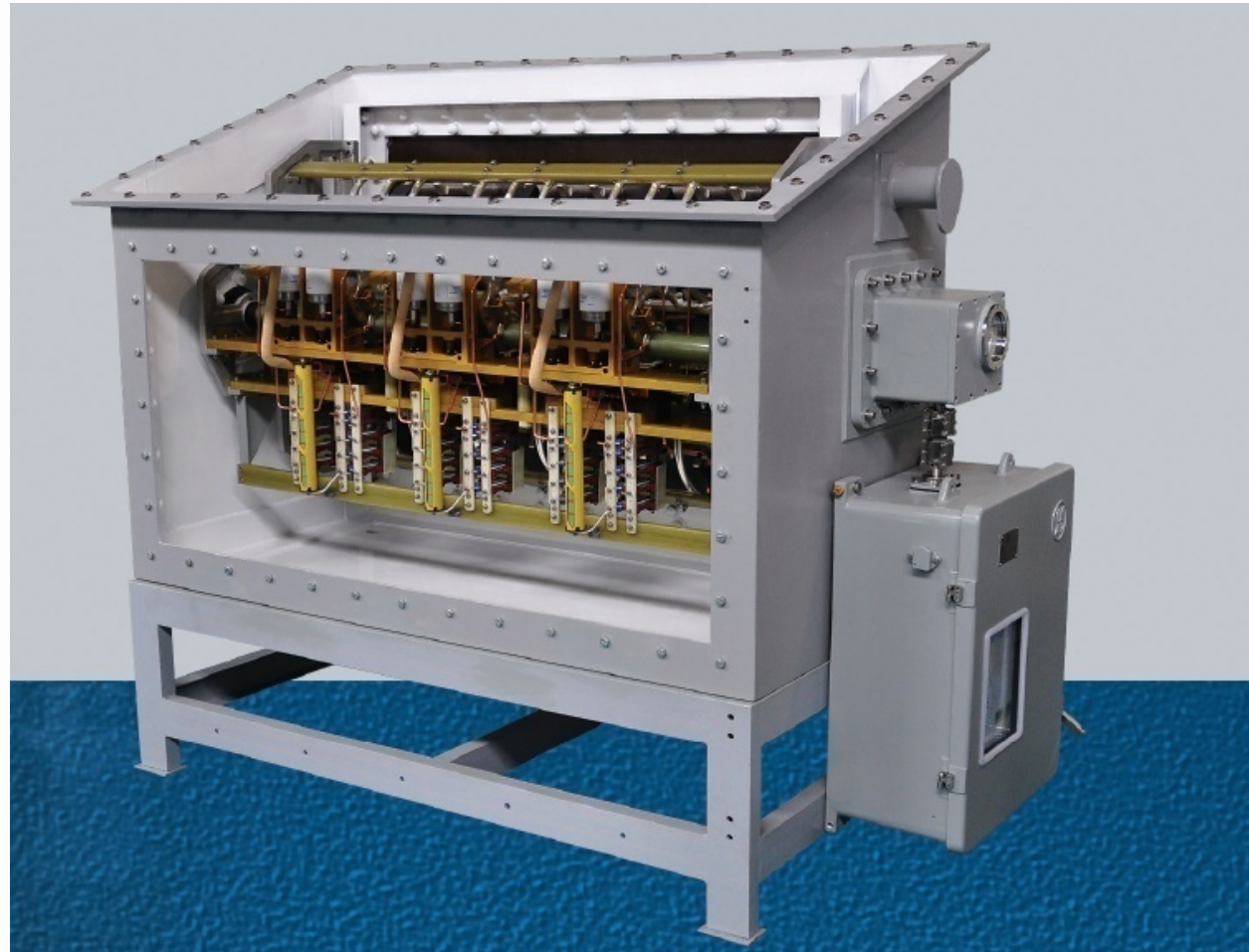


- High-Resolution
- ◆ Touch Screen
- ARM9 400 MHz
- ◆ High speed CPU
- 256 Mb Flash
- 64 Mb SDRAM
- ◆ Data logging

### ◆ SHM-K Remote Controller

**Product in R&D**

**The world 1<sup>st</sup> On-tank resistive vacuum LTC**



## Product in R&D

# Next Version of SHM-DL for a smarter grid

### SHM - DL

- ✓ OLTC Automation
- ✓ OLTC condition monitoring
- ✓ Transformer condition monitoring port
- ✓ Communication protocol





**Thank you very much  
for your attention**