



Retrofitting Medium Voltage Old MOCB Switchgear with VCB

Upgrading Technology
with
Cost Effective Solutions



UPGRADING TECHNOLOGY

For medium voltage range (upto 36kV), utilities in India have been using Minimum Oil Circuit Breakers (MOCBs) at power generation and distribution centres for more than 30 years.

MOCBs, using oil as an arc quenching and insulating medium, have following limitations:

- Frequency and level of maintenance are high.
- Limited operational and short-circuit operational life.
- Vulnerable to fire hazards associated with oil.

Advent of new technology, viz. Vacuum, with its superior dielectric and arc interruption properties, has not only eliminated all the limitations of MOCBs, but have also made the circuit breaker more compact and highly reliable. Utilities, therefore, are adopting vacuum technology for their new installations, indoor as well as outdoor upto 36 kV.

Hence, to ensure reliable, uninterrupted power supply and reap the benefits of vacuum technology, it is imperative to upgrade the technology of existing installations with MOCBs, so that they transmit and distribute power efficiently with minimum outage and interruptions. '**Retrofitting**' old MOCB switchgear with VCB is the cost effective alternative, which will improve the life and reliability of switchgear without going for large investment.

PIONEERING EFFORTS

Jyoti has been in the forefront of Medium Voltage switchgear since early sixties, having technical collaboration with erstwhile Calor-Emag. of West Germany. Jyoti has supplied more than 20,000 MOCBs to thermal power stations,

petrochemical complexes, refineries and transmission & distribution sub-stations of various state electricity boards in India. Keeping pace with the technological changes, Jyoti entered into technical collaboration with Toshiba Corporation, Japan in mid eighties for manufacturing a wide range of Vacuum Circuit Breakers. Jyoti has manufactured more than 12,000 nos. of VCBs till date and they are working satisfactorily.

Jyoti has excellent testing facilities and infrastructure in the form of machine shops, tools, jigs & fixtures, which facilitate one-to-one replacement of MOCB with VCB ensuring perfect alignment of truck with panel, which results either in improvement of thermal rating or reduction in temperature rise.

MOCBs VIS-À-VIS VCBs – ADVANTAGES

Jyoti has undertaken '**Retrofitting**' of MOCBs with VCBs aggressively as it offers following advantages:

- Cheaper and simpler alternative for the old installation, whose service-life is almost over.
- Benefits of vacuum technology made available with minimum installation cost.
- Frequency of maintenance drastically reduced.
- No need to store large quantity of costly spares of MOCB which may not be available because its manufacturing has been tapered off.
- Installation can be provided with increased load current and fault level as VCB is quite compact

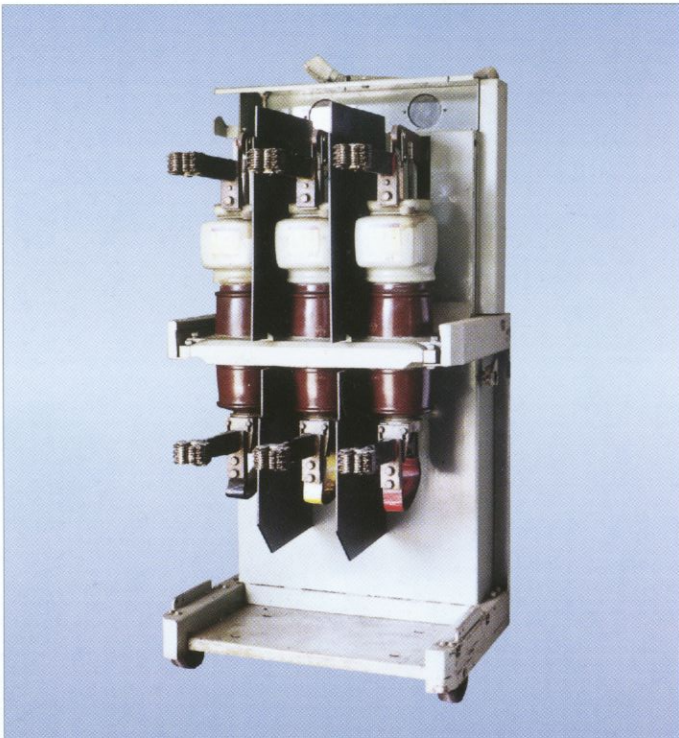


Fig.:1 'Jyoti' MOCB Truck



Fig.:2 'Jyoti' Cassette type VCB Draw-out unit

compared to MOCB of similar fault level. However, corresponding specifications of CT as well as support system requirement should be taken into consideration.

- In case of expansion with VCB technology, 'Retrofitting' of old MOCB panel will eliminate the need of simultaneous maintenance of two different equipment.

The concept of 'Retrofitting' developed at Jyoti does not call for replacing the entire switchgear. This eliminates large investment because it does not require :-

- Modification in foundation.
- Change in the power cable route.
- Change in control cable route.
- Shutdown, which would result in loss of power generation and consequently loss in production.

Jyoti undertakes 'Retrofitting' i.e. changing the MOCBs of any make and type (Fig.:1) by VCBs either

- by offering one-to-one replacement OR (Fig.:3&4)
- by offering cassette type draw-out units. (Fig.:2)

ONE-TO-ONE REPLACEMENT

In this arrangement, the MOCB is replaced by VCB on the same truck, retaining the same interlocks. It is just removing the MOCB truck and replacing it with VCB truck. Panel does not require any modification, nor does the foundation or

cable route calls for any change. And of course, **NO shutdown**. The MOCB truck can be retained as a spare for emergency. The operators, who are familiar with the working of MOCB, can easily deal with new VCB without undergoing any training.

CASSETTE - TYPE DRAW-OUT UNIT

In this arrangement, VCB truck is offered with complete safety interlocks, shutter, contact shrouds etc. as per new design. The breaker compartment is totally segregated from busbar and cable compartment. The unit is quite sturdy and able to withstand all kinds of forces that develop during short circuit test.

This arrangement is preferred when interlocks are required to be changed or when segregation of VCB compartment is necessary. This arrangement, however, requires related changes in panel and may call for shutdown for a short period.

FIELD EXPERIENCE

Jyoti Ltd. has successfully carried out 'Retrofitting' of nearly 1000 MOCBs with VCBs in last decade at number of installations. The performance of switchgear at these sites has been quite satisfactory. The response from customer is highly encouraging. The utilities with existing MOCB installations are increasingly going for 'Retrofitting' for upgrading their equipment, since the cost of 'Retrofitting' is less than 50% of the cost of new VCB panel installation. Together with improving the performance, reliability and also the fault level in many cases, 'Retrofitting' offers the most cost-effective solution.



Fig.:3 Rear View of 'Jyoti' One-to-One VCB

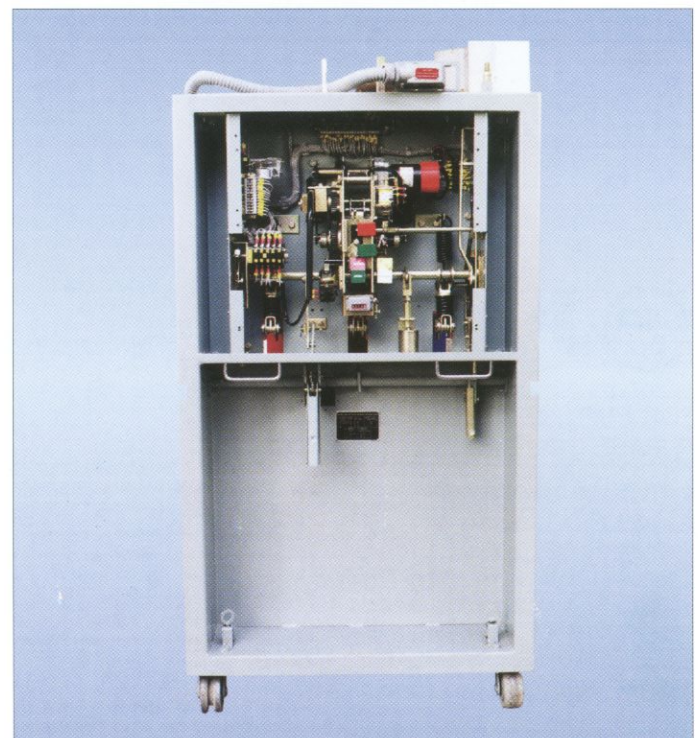


Fig.:4 Front View of 'Jyoti' One-to-One VCB

SELECTION CHART FOR RETROFITTING 'JYOTI' MOCBs WITH 'JYOTI' VCBs

Sr. No.	Existing Panel Type of MOCB Panel	Existing MOCB			Recommended VCB		
		Type of MOCB	Current Rating in Amp.	Fault Level KA	Type of VCB	Current Rating in Amp.	Fault Level KA
1.	11/6.6/3.3 KV 860 / PA1 / PA1-M	OZ2	630	13.2	VK10J25	630	25
		OZ2	1250	13.2	VK10M25	1250	25
		OZ2	800	18.4	VK10M25	1250	25
2.	11/6.6/3.3 KV ZK4 / PB2 /	OZ2	630	18.4	VK10J25	630	25
			1250	18.4	VK10M25	1250	25
		OD1	630	25	VK10J25	630	25
			1250	25	VK10M25	1250	25
3.	11/6.6/3.3KV PA3 / PA3-1	OZ2	630	13.2	VK10J25	630	25
		MT1	1250	18.4	VK10M25	1250	25
			800	18.4	VK10M25	1250	25
4.	11/6.6/3.3KV PB3 / PB3-M	MS1/MS2	1250	25	VK10M25	1250	25
		MS3	1250	40	VK10M40	1250	40
			1250	25	VK10M25	1250	25
5.	11/6.6/3.3KV PA-3/M	MT1	630/ 1250	25	VK10J25 VK10M25	630/ 1250	25
		MS3	1250/ 1600	40	VK10M40 VK10P40	1250/ 2000	40
6.	11/6.6/3.3KV PC3 / PC3-1	MS2	2000	upto	VK10Q40A	2500	40
		MS1	2500	40KA	VK10Q40	3150	40
		MS3					
7.	11/6.6/3.3KV 860 / PA1	OZ2 MT2	630 / 800 / 1250	13.2 to 25	VCB along with new panel Similar to existing panel type 860 / PA1 / PA1M		
8.	33KV PG1 / 2K4	OD1	630	13.2 /	VY30M25	1250	25
		OZ2	1250	25			
9.	3.3 / 6.6KV ZK4 / PB2 / PB3 PA3 / PA3-1	OZ2	630 800	13.2 18.4	JVM1-604 JVE1-604	400A	upto 25
		OD1	1250	25			
10.	3.3 / 6.6 / 11KV PE1	MT2	630	13.2	VK10J25	630	25
		MT1	800	18.4	VK10M25	1250	25
			1250	25			



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