



VARMATIC RAPIDE (VR)

DESIGNED TO IMPROVE POWER QUALITY



The SDC Industries **VARMATIC RAPIDE (VR)** is an industry-leading solution manufactured to improve power quality on oil and drilling rigs. This innovative, all-in-one unit's internal components and software package provide software intelligence to counteract the effects of :

POWER FACTOR

HARMONICS

VOLTAGE SAGS

VOLTAGE SWELLS

VOLTAGE FLICKER

TRANSIENTS

"Power Quality" is a term used to define any occurrence of voltage, current or frequency deviation on your low voltage power system that results in :

EQUIPMENT FAILURE

PROCESS INTERRUPTIONS

POWER SYSTEM INEFFICIENCY

Switching of reactive loads allows harmful transients, harmonics and other problems to make their way through the power system. By utilising the VR, these problems can be minimised or eliminated. In addition, the VR would be beneficial when reactive compensation is required to meet specific load demand. The unit is capable of :

- switching at intervals down to 20 milliseconds to counteract the effect of peak loads
- removing all transients from switching
- reducing drops in voltage and any resultant flicker
- maintaining a long life-span, due to its robust nature.

**THE SDC INDUSTRIES VR IS CAPABLE OF SWITCHING
LARGE AMOUNTS OF REACTIVE COMPENSATION IN AND
OUT OF CIRCUIT IN TIMES DOWN TO 20 MILLISECONDS**



THE SDC INDUSTRIES VR

- ➡ Each system is manufactured to client specification, following on-site measurements taken using sophisticated power monitoring equipment
- ➡ Can be installed on systems up to 690V; 50/60Hz; single or three phase
- ➡ System protected by high speed fuses
- ➡ Harmonic filtration built-in
- ➡ High Power Thyristors
- ➡ Capacitors and Reactors used are manufactured to a high specification by SDC Industries
- ➡ Three phase network analyser included
- ➡ Container and equipment manufactured to DNV and Lloyds Specification.

WHY SHOULD YOU INSTALL THE SDC INDUSTRIES VR

- ➡ Improves power quality
- ➡ The VR, through its ability to absorb harmonic currents, will reduce the Total Harmonic Distortion on the rig's electrical system
- ➡ Alleviates stress on cables, switchboards, transformers and generators
- ➡ The micro-processor controlling the unit ensures transient-free switching
- ➡ Prevents voltage drops and flickers, typically occurring in real-time applications
- ➡ Electrical load is more constant
- ➡ Peak demands are dramatically reduced, thus alleviating stress on cables, switchboards, transformer and generators, leading to a longer life for components
- ➡ Operational hours of generators will fall, hence reducing maintenance costs



GENERAL DESCRIPTION

The SDC Industries VR process begins with a POWER SYSTEMS ANALYSIS of your electrical system. From the outcome of this report, our highly trained in-house engineers can design a unit to suit each client's specific requirements.

The Harmonic Filter Bank will be designed to be connected to the drilling generator switchboard, to reduce the harmonic content of the supply voltage and current, together with improving the power factor of the load supply. This reduces the KVA supply taken from the bank of generators.



The unit, will be designed in a specific amount of stages of KVAR, and will be switched in by a Power Factor Correction computer as the load on the generators varies. Each stage is mounted on a galvanised steel base and open frame, which is housed within a steel shipping container. In addition, the open frame will also house a three phase busbar arrangement suitable for the busbar current for the filter bank. The unit will be designed to DNV and Lloyds Specification.



The steel container walls, roof and doors can be fitted with thermal insulation materials to reduce the amount of heat that will be transmitted from the outside environment.

Zone 2 approved electrical items will be fitted to the external steel container, as follows :

- 10KW Air Conditioning Unit to control temperature within the container.
- Fluorescent lighting units to provide illumination for maintenance work.
- 1000 Watt anti-condensation heater.



Two personnel doors will be fitted to each side of the container and two full size double doors will be situated on the front of the container to allow complete access to the internal components. All doors will be fitted with Castell security keys which prevent access into the units unless the circuit breaker supplying the filter bank is opened. The circuit breaker will be fitted with a Castell security key, designated "PFC", which will only be able to be removed when the breaker is in the "OFF" position. The key, designated "PFC" will be entered into a key exchange box, which will allow the release of the individual door keys.



POWER SYSTEMS ANALYSIS

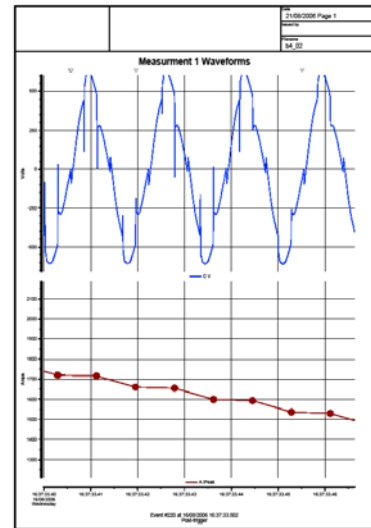
Procedure

In the first instance, a power systems analysis will be carried out on your electrical distribution system by our highly-experienced engineers. The results of this analysis will form the basis of the specification of each unit.

Power Monitor Measurements

The power monitor measures the following parameters :

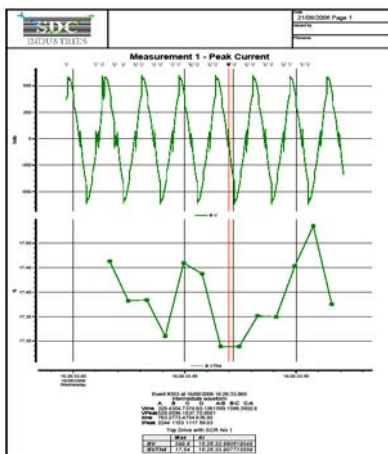
- true volts RMS and amps RMS
- watts, volts amps and volt amps reactive
- power factor
- frequency
- voltage unbalance
- voltage total harmonic distortion
- current total harmonic distortion
- current crest factor
- nth harmonic, voltage/current
- K Factor
- demand, energy, sags and swells
- individual harmonics to 50/60Hz
- voltage/current transients



WAVEFORMS

The above parameters can be viewed using the following methods :

- SCOPE MODE : showing real time viewing of voltage/current waveforms and phasor diagrams;
- METERING MODE : showing the selected parameters updated every second;
- VIEW DATA MODE : in which the recorded data can be viewed easily to show where problems exist;
- TIME PLOT MODE : which displays a graph of the selected parameter since recording began up to a maximum of 10 days.



PEAK CURRENT

SDC INDUSTRIES WILL PROVIDE A DETAILED REPORT SHOWING THE ANALYSIS IN FULL, HIGHLIGHTING ANY PROBLEMS ON THE SYSTEM.



THE SOFTWARE

SCADA System

The mini-SCADA is an easy-to-use web based SCADA system. Both local and remote monitoring and control is supported over Ethernet, Internet, LANs, Telephone Modems, GSM and GPRS. The miniSCADA hardware has a built-in web server that operates when customizing the graphical user web interface. Everything is done by clicking your way through the onboard web pages using a standard web browser at any computer. Therefore, no windows tools or HTML editors are needed.



Measurement :

- Measures waveforms
- Measures harmonics
- Readings are provided for three sections :
 - Supply
 - Load Centre
 - Capacitor System.
- the three sections are measured by two sets of CTs only : one fitted within the capacitor system and the other fitted either at the mains or the load.

THE CONTROLLER

The operating parameters of the PFC computer, when operating, will switch in the correct number of stages to achieve the target PF value set in the regulator. Each stage will be switched at the switching interval set in the PFC computer. With reductions in load, excess capacitance will also be disconnected by the PFC computer again at the switching interval to maintain the target PF value. The controller has a communication output, which allows the controller information to be transmitted to a remote PC housed in the control cabin.

The controller performs two major functions :

Control :

- Constantly samples currents and voltages
- Analyses the precise capacitor groups required to obtain an accurate power factor or KVAR.
- Runs system tests to analyse unit condition, provides malfunction indications (and adjusts unit operation as required).
- Generates precise firing pulses for the switching module as required to connect or disconnect capacitor groups.

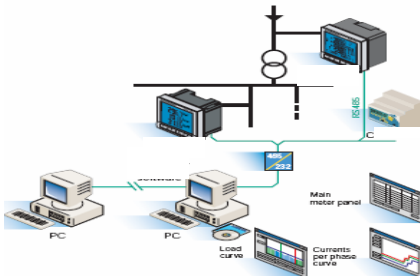


Switching Modules : Comprises switching elements (SCRs) and firing circuits and utilises outside circulation cooling. Used for transient-free connection and disconnection of capacitor groups.

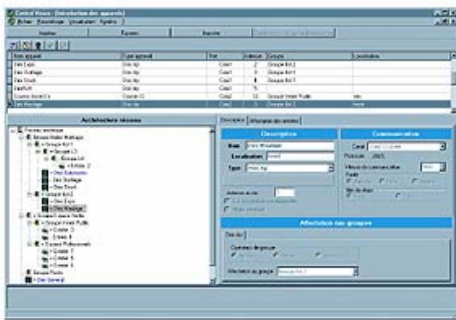


CENTRALISATION OF THE INSTALLATION PARAMETERS

The software communicates by RS 485 link and use the JBUS/MODBUS protocol. By running in the Windows environment, it can also communicate with all the products in the installation and create histories based on manual or automatic scanning.



By utilising this software, the SDC Industries VR offers the possibility of displaying all the electrical quantities measured by reading the energy consumptions of the rig. The user can also remotely control the triggering device, and also create histories for several electrical quantities over a given period.



Introduction of the Software

This piece of software can be used by the operator of the communication network, but also via the Intranet network to provide access for all those interested in the information stored in the database.

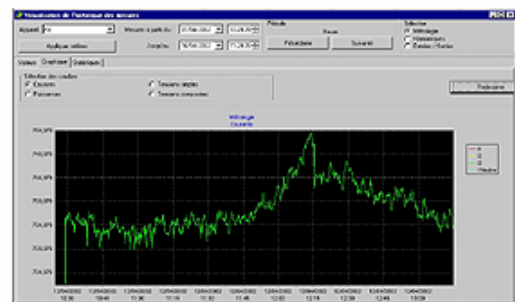
All these functions can be carried out for one piece of software (corresponding to one output) or a whole group of software units defined in advance. The user will also be able to intervene on the configuration of each device installed on the digital link used by the software.

The standard communication protocol used allows the products on the distribution network to be more easily deployed over time. A first, obligatory stage consists of the installation of a cable suited to the RS485, or even the attribution of available pairs in an existing cable. The ease of integration and increasing the number of units on this RS485 link means that this can be made into a listing solution.



Monitoring of the voltage and current supply from each generator will be carried out. Three current monitoring current transformers, one per phase, will be connected onto the generator busbars in addition to the voltage supply signal. These signal supplies will be connected to a digital multimeter unit, one for each generator, housed in a sheet steel wall-mounted cubicle located in the generator compartment. The multimeter will be fitted with both harmonic and communication modules, and will provide the following information for each generator supply :

- Current per phase and instantaneous, average and maximum values over a programmable period.
- Phase-to-phase voltages, instantaneous, average and maximum values over a programmable period.
- Frequency, instantaneous, average and maximum over a programmable period.
- Active power on four quadrants per phase and total in instantaneous, average and maximum values over a programmable period.
- Reactive power on four quadrants per phase and total in instantaneous, average and maximum over a programmable period.
- Apparent power per phase and total in instantaneous, average and maximum over a programmable period.
- Power factor per phase and total with inductive and capacitive indication.
- Harmonic Distortion Rate (THD) up to 51 harmonic on phase to phase voltage and currents.
- Hour run meter.
- Real and historic time, allowing faults to be analysed.



Measurement history curve

The information will be transmitted via the communication module to a remote PC unit housed in the control cabin. In addition to the above information for the generators, a similar unit will be housed in the container, which will provide similar information on the harmonic filter bank.

GLOSSARY OF TERMS

Power Quality

Any occurrence of voltage, current or frequency deviation that results in equipment failure, process interruptions, or power system inefficiency. These deviations can manifest themselves in harmonics, power factor, voltage sags/swells, voltage flickering, transients and many other forms.

Voltage Sags (Voltage Drops, Under-Voltage)

Voltage sags, also known as voltage drops or under-voltage, are caused by local loads, either during motor start-up or from rapidly changing loads. This condition is characterised by low power factor and high reactive energy demand.

Voltage Flickering

Voltage flickering is caused by fast voltage fluctuations commonly associated with rapid loads.

Power Factor

In many cases, low power factor can result in higher utility bills through penalties and increased demand charges. It also causes system energy losses, overheating, increased maintenance costs and low service utilisation.

Harmonics (non-linear loads)

High harmonic voltages and currents cause significant energy losses, overheating and dramatically increase site vulnerability to failures and fire.

Transients (Spikes)

These can cause significant damage to equipment, produce unpredicted power supply failures and degrade electrical equipment.



**IF YOU WOULD LIKE TO FIND OUT MORE ABOUT THE SDC
INDUSTRIES VARMATIC RAPIDE, PLEASE CONTACT US ON**

01355 265959

OR E-MAIL

info@sdcindustries.co.uk



The information contained in this booklet is for general guidance only. For a precise explanation, or to provide our engineers with your exact requirements, please **CONTACT US** on **01355 265959** or e-mail **info@sdcindustries.co.uk**

SDC INDUSTRIES LTD, 18 COLVILLES PLACE, KELVIN INDUSTRIAL ESTATE, EAST KILBRIDE, SCOTLAND, G75 0PZ

TEL : 01355 265959 FAX : 01355 265484 E-MAIL : info@sdcindustries.co.uk www.sdcindustries.co.uk

VR001