

# UPS

## Empowering the info-revolution



Our dependence on electric power is only next to food and water in today's world. The electronic age has only intensified this need with an emphasis on quality and consistency of power. Uninterruptible power supply or UPS systems have fulfilled this need. Today's UPSs are not merely back up power boxes, but they are smart and intelligent systems capable of catering to the modern IT needs. In India, where we have neither the continuity nor the quality of power supply, UPS has emerged as the single most important equipment for the industrial and business growth

■ Sonali Kanwar  
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Ever since it was discovered, power has become a *sine qua non* for development in the modern world. It has turned out to be an integral part of our everyday lives so much so that life without it is almost unimaginable. With the advent of electronics, power utilization assumed a new dimension. Quality of power became an important factor in the electronics age. With the rapid growth of electronics, the need for clean and consistent power became a necessity. This need has been further emphasised with the proliferation of information technology into all walks of human life. Even though, the modern electronic gadgets can run on the same power that lights homes and industries, the sophisticated circuitry of electronic devices calls for uninterrupted as well as unadulterated power supply for efficient functioning. This is accomplished by uninterruptible power supply or UPS systems.

As the name suggests, a UPS system ensures uninterrupted power or back up power supply, but that is not the only thing it does. A host of additional features have ensured that UPS systems are an integral part of the rapidly proliferating IT revolution.

#### First the basics

The power generated at the power grid is in its purest form. But this power cannot be used directly as the voltage generated is generally of the order of tens of thousands of volts (as in the case of a typical hydroelectric power station) and also power can never be used at its point of generation. The generated power should be transmitted and transmission of power accounts for loss of power and also distortions, which creep in during transit. When the power ultimately reaches the point of utility in the desired voltage and frequency, it would have already gone through several distribution channels and points.

What a computer expects is AC power of 220 V oscillating at 50Hz.

A computer can tolerate slight differences from this specification, but any significant deviation will cause the computer's power supply to fail. This is where a UPS comes to its rescue.

#### UPS

A UPS generally protects a computer against four different power problems:

- Voltage surges and spikes - times when the voltage on the line is greater than required.
- Voltage sags - times when there is power on the line but is less than it should be.
- Total power failure (black out) - times when a line goes down or a fuse blows somewhere on the grid or in the building
- Frequency differences - times when the power is oscillating at something other than 50 hertz.

A typical UPS protects systems against power defects like surges and sags which are caused by rapid fluctuation in the amplitude of the alternating current (AC), and insures them against low voltage and no power conditions. A UPS also maintains a load and power back-up. The main elements of any UPS are the rectifier, inverter, static bypass switch (SBS) and service bypass. The configuration, once complete with a battery for energy storage, offers a no-break standby power supply. The rectifier outputs a DC voltage that is converted by the inverter into AC, which supplies the connected loads with constant voltage and frequency. In case of a mains failure, the battery feeds power to the loads through the inverter. Unusual overloading of a UPS unit does not lead to blackout because the SBS transfers the load without interruption to the mains supply until the overload dies down.

There are two common types of UPS systems in use today: standby UPSs and continuous UPSs. A standby UPS runs the computer off

the normal utility power when it detects a problem. At that point it very quickly (in 5 milliseconds or less) turns on a power inverter and runs the computer off the UPS's battery. A power inverter simply turns the DC power delivered by the battery into 220 volt, 50 hertz AC power.

In continuous UPS, the computer is always running on battery power and the battery is being continuously recharged. The battery charger continuously produces DC power, which the inverter continuously turns back into 220 volt AC power. If the power fails the battery provides power to the inverter. There is no switchover time in continuous UPS. This setup provides a very stable source of power.

Standby UPSs are far more common for home or small business use because they tend to cost about half as much as a continuous system. Continuous systems provide extremely clean, stable power, so they tend to be used in server rooms and mission critical applications.

### Technology

Mr. N.K. Moorthy, Director, Kaveri Powertronics Ltd., explains the UPS technology and its gradual upgradations at length, "A UPS has two stages - the inverter and the converter. The first technical segment of the UPS is the inverter. Earlier inverters were used to supply natural power and maintain machines. Based on the Thyatron principle, these inverters were very successful with the only disadvantage being heavy loss in power. With the focus however shifting to energy conservation, this technology, though reliable, was gradually put out of use. Soon the transistor proved effective at power handling and the bi-polar transistor became the most sought after device at the inverter level. The inverter, saw further upgradation with the full wave generation; the square wave inverter and later the sine wave inverter with the pulse wave modulation (PWM)

## POWER PROTECTION EQUIPMENT

### Switching power supplies

The most basic defense against power disturbances is located right in the power supplies of most electronic equipment. These power supplies act as filters, "cleaning" the incoming AC and sending it to the components as DC power. Even though these power supplies can remedy many of the small AC disturbances and protect your equipment to a small degree, they cannot begin to filter everything the AC line has to offer. Repeated hits of spikes and noise will break down the efficiency of the minimal built-in power protection.

### Spike and surge protectors

By far the least expensive type of power protection, spike and surge protectors (or "clippers") act by cutting off voltage when it exceeds a certain level and sending this offending voltage away from the sensitive circuits of electronic equipment. Whereas these surge protectors are good for short-term use, and they are inexpensive (usually under \$50), the MOVs inside them degrade after a relatively short time due to repeated heating and cooling. Also, these protectors will function as long as the voltage does not exceed the specifications of the components inside.

### Power line filters

Power line filters are designed to suppress spikes, surges, and noise before they get to the clipping level of common surge protectors. Instead of clamping the voltage when it exceeds the cutoff, the power line filter limits noise and spikes to a safe level by slowing down the rate of change of these problems, thereby keeping electronic systems safer than the surge protectors can. Of course, these filters are more expensive.

### Computer grade transformers

These power-protecting devices are multiple shielded transformers whose job it is to suppress spikes and common mode noise. Although this seems much like power line filters, they are different in that they isolate primary and secondary AC, thereby establishing a safe and reliable ground for the electronic device it is protecting. Computer grade transformers are ideal for use when grounding is a problem because of an industrial environment.

### Line voltage regulators

Voltage regulators maintain voltage to within a very narrow tolerance regardless how much the AC line varies in terms of voltage. While these regulators offer some surge protection, they do not provide good isolation like computer grade transformers.

### Power line conditioners

These are excellent power protection devices as they are essentially a combination of computer grade transformers and line voltage regulators. They provide spike, sag, surge, and noise suppression while isolating the AC lines and providing an excellent system grounding point.

The other types of power protection equipment are of course uninterruptible power supplies and standby power supplies. These are the most complete power protection devices available.

## THE MANY FACTS OF A POWER FAILURE

Electronics age calls for clean, consistent and continuous power supply. This is exactly what our electricity boards are unable to supply. But businesses all over the world are getting increasingly electronics dependent. Therefore, ensuring an uninterrupted power supply, which adheres to the requirements of the sensitive electronic equipment, has assumed great importance.

### IBM study

A study by IBM has showed that a typical computer is subject to more than 120 power problems per month. The effects of power problems range from the subtle-keyboard lockups, hardware degradation-to the dramatic-complete data loss or burnt motherboards. According to a survey by the Yankee Group, almost half of the corporations researched put their downtime costs at upwards of \$1,000 per hour, with nine percent estimating costs up to or more than \$50,000 per hour.

Clearly, businesses are becoming more and more reliant on a utility power supply that is pushed beyond its capacity. Despite advances in the

### Power problems are the largest cause of data loss

Power Failure/Surge	45.3%
Storm Damage:	8.2%
Fire/Explosion	9.4%
Hardware/Software Error:	8.2%
Flood&Water Damage:	6.7%
Earthquake:	5.5%
NetworkOutage:	4.5%
HumanError/Sabotage:	3.2%
HVACFailure:	2.3%
Other:	6.7%

Source: Contingency Planning

capabilities of modern personal computers, a momentary power outage is still all it takes to lose valuable data. More dangerous is the loss of previously written files, or even an entire hard disk, which can occur should a power problem strike while a computer is saving a file. Network file servers constantly writing to disk are particularly susceptible.

Unfortunately the situation won't be getting better anytime soon. It takes approximately a decade to get a new power plant on-line, and concerns about nuclear power and

fossil fuels have stifled the construction of new generating facilities.

### The anatomy of a surge

What really happens to a computer when it experiences an out-of-bounds power anomaly?

Let us take the example of a lightning striking a nearby transformer. If the surge is powerful enough, it travels instantaneously through wiring, network, serial and phone lines and more, with the electrical equivalent force of a tidal wave. The surge travels into the computer via the outlet or phone lines. The first casualty is usually a modem or motherboard. Chips go next, and data is lost.

The utility responds to over voltages by disconnecting the grid. This creates brownouts and blackouts. If the voltage drops low enough, or blacks out, the hard disk may crash, destroying the data stored on the disk. In all cases, work-in-process stored in cache is instantly lost. In the worst case, password protection on the hard drive can be jumbled, or the file allocation table may be upset, rendering the hard disk useless.

## POWER EVENT DEFINITIONS

### Sags

Also known as brownouts, sags are short-term decreases in voltage levels. This is the most common power problem, accounting for 87% of all power disturbances according to a study by Bell Labs.

### Blackout

It is a total loss of utility power. Excessive demand on the power grid, lightning storms, ice on power lines, car accidents, earthquakes and other catastrophes cause blackouts. Blackouts lead to total loss of data stored on hard drives.

### Spike

Also referred to as an impulse, a spike is an instantaneous, dramatic increase in voltage. Akin to the force of a tidal wave, a spike can enter electronic equipment through AC, network, serial or phone lines and damage or completely destroy components. Spikes are typically caused by a nearby lightning strike.

### Surge

It is a short-term increase in voltage, typically lasting at least 1/120 of a second. Surges result from presence of high-powered electrical motors,

such as air conditioners, and household appliances in the vicinity. When this equipment is switched off, the extra voltage is dissipated through the power line.

### Noise

Technically referred as Electro-Magnetic Interference (EMI) and Radio Frequency Interference (RFI), electrical noise disrupts the smooth sine wave one expects from utility power. Electrical noise is caused by many factors, including lightning, load switching, generators and radio transmitters.

technology (i.e. modulating the pulse and controlling the waveform). Next came the high pitching frequency digital logic PWM system. Since the inversion speed of the devices in the system had achieved a remarkable growth, a need to reduce the harmonic distortion was felt. For this, high pitching frequency came into existence with MOSFET (Metal Oxide Semi-conductor Field Effect Transistor). However, MOSFET had a disadvantage i.e. the drain capacitance needed to be brought down and to counter this, a combination of MOSFET and Bi-polar transistor was introduced. The converter, over the years, has remained the same i.e. Thyatron-based all over the world.”

A recent major breakthrough has been the IGBTs (Integrated Gate Bi-polar Transistor), in which Gate was again MOS (Metal Oxide Semiconductor). This technology



became very popular and has been prevalent globally for the past six years. It was introduced in India 4 years ago. There have been experiments with MCTs (MOS controlled Thyristor), but these have not been fully successful as Bi-polar remains more preferred.

#### Added features

What companies like APC and PowerMax are delivering is much

more than mere power protection. Sometimes providing solutions to problems and most other times anticipating problems and designing solutions, these companies are actually setting the pace for IT growth, by focussing on power protection technologies as their core competence.

Power distortions, power blackouts can put computers at a heavy risk. UPS systems like Back-UPS from APC instantly switches the computer to emergency battery backup power during such situations and allows the user to work through brief power outages or shuts down the system automatically in the event of an extended outage.

Lightning is another major cause of power anomaly. Power surges of unmanageable proportions gets into the transmission lines and destroy the circuitry of electronic systems. This is efficiently countered by lightning

## LIGHTNING FACTS

- There are 100 flashes of lightning per second on earth. USA insurance company information shows one homeowner's damage claim for every 57 lightning strikes.
- Myth: lightning never strikes twice in the same spot. Nothing could be further from the truth, especially in the case of tall structures. The Empire State Building has been struck as many as twelve times in 20 minutes.
- It takes only a second for a sudden power surge through either the mains power or more likely, your phone line, to destroy your computer.
- Your phone lines are completely unprotected. The public phone system always has a little current flowing through it. During a storm, any electrical buildup is going to get conducted straight

through those lines to earth.

Again, your modem is the easiest route for a power surge into your PC/Mac.

#### Protecting the Modem and Other Peripherals

It is not enough to protect the computer alone but even the modem attached to the computer should be protected, which is in direct connection with the external telephone line. Lightning can be carried along the line and into any home, damaging the modem and possibly even the motherboard or other components. Even the television that is hooked up to coaxial cables for cable TV service or digital satellite service, is not free from power problems due to power surges which creep into the coaxial cables. Voltage spikes can be carried along any convenient wire

and into any PC. In particular, wires that run between buildings are susceptible to major disruptions due to lightning—which is why it is illegal in many places to run copper network wiring outdoors. It is also possible for a spike to be carried along a networking cable, causing similar effects. In fact, a spike on a network line can damage every PC on the network! Most good power protection systems include protection for the modem line. If a modem is used then you want to use a system that will protect it as well. The network will generally be protected if every PC on it is properly protected, as long as network cables are not run outside between buildings.

A laser printer should not be run off a conventional PC UPS as they draw a tremendous amount of power when they start up and most UPS cannot handle them.

protectors built into modern UPS systems. Plugging a phone line into the computer doubles its vulnerability to power problems; any additional peripheral, and the susceptibility triples. Multitasking networked environment poses its own set of problems or stand-alone PCs. The more you do with your PC, the more you stand to lose.

### Innovations

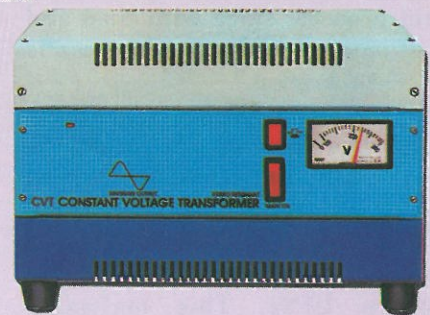
"The traditional UPS was more a 'battery-in-a-box' says Rishipal Sethi, Country Manager, APC, "However, today the UPS is an intelligent product that integrates performance, efficiency and various additional functionalities. Innovations include software that allows remote manageability and safe shutdown with no damage to data; in terms of hardware it has moved to sophisticated units that offer practically 100 per cent uptime. With the introduction of new technologies like MOSFET (Metal Oxide Semiconductor Field Effect Transistor), IGBT (Integrated Gate Bi-polar Transistors), PWM, etc., both the size and cost of the UPS system have been greatly reduced. The latest technologies in the UPS industry include high frequency systems based on ferrite core magnetic design and inventions such as the 'Green UPS'. Green UPS, as the name suggests, are environment-friendly, energy-saving systems (due to lower power consumption) that do not pollute the incoming mains and have input current distortion of less than 7 per cent, enabling a clean circuit environment. With the recent technological upgradations in the UPS, its overall efficiency has increased from the earlier 60-75 per cent to 90 per cent. This system today, has additional features such as automatic programs when dangers like fluctuations, low battery conditions etc. are sensed and software compatibility that allows one to keep a check on the entire system.

## CONTROL VOLTAGE TRANSFORMER

With the advent of the PC revolution in India, computer users realised the extent of data catastrophe that the country's erratic power supply situation could cause. To protect their hardware and software, then PC users, began to rely on servo controlled voltage stabilisers. These held the market till, owing to the progressive pace of technology, the control voltage transformer was introduced - a product that promised reliable voltage as well as clean input.

Beside constant voltage, a CVT provides an almost pure sine wave, guards against spikes and surges, suppresses transients i.e. provides isolations and prevents sharp fluctuations from being transferred from the mains to the user's equipment. It also protects all microprocessor based equipments which being usually designed to operate on very narrow voltage bands, are sensitive to large voltage variations.

A good quality CVT typically combines the features of three different line conditioning equipment - line filters/surge suppressors, servo stabilisers and isolation transformers. The output of the CVT is taken from the saturated secondary section of the transformers which has an energy reserve close to 5 milliseconds at full load, and hence bridges small interruptions and large dips in the line voltage. The selection of a CVT should be a systematic procedure as its performance is determined by numerous factors. A good quality CVT



- a) Should be able to function from no load to full load conditions,
- b) Its power rating should match that of the load including the initial surge specification and
- c) Should also take into account the future expansion of the load like addition of extra drive in a computer, EPABX exchange lines etc.

Though an ideal solution for an infrequent computer user, a CVT falls short when it comes to supporting larger networks. A CVT is highly energy inefficient at low loads, leads to a lot of power loss, generates electromagnetic interference and a considerable amount of noise. None of the CVTs are intelligent, being based on the basic ferro resonant type of technology. No technical development whatsoever has taken place in the CVT design for the past ten years. As compared to the 90 per cent efficiency of the UPS, the CVT offers only a maximum of 87 per cent efficiency.

Despite the significant progress, made in this realm, there are a few downslides, feel industry experts. Rajnish Mathur, Instapower, points out; "The Indian UPS systems are technically still lagging several years behind their foreign counterparts. Though Indian versions of foreign technologies are equally reliable and

at par, contributions of the Indian industry to the technology growth has been inconsequential. By way of innovations, there has been none from the technology point of view. The drawback is mainly owing to backward transformer technology existing in the country. The domestic transformer industry lacks good magnetic material

at a reasonable cost.”

“New technologies appear to be expensive during initial investment though the running expenses are substantially lower than the conventional,” says Bernard Lal, Director-Mktg, Fiskars. “The success rate of innovative products, with apparently higher costs, is hampered due to the short-sightedness of a major segment of the market, which does not realise that eventually both the initial and recurring costs of such products prove lower. However, this is a short-term process, since with time and experience, consumer awareness is bound to develop.”

### Modern Features

**Multi-path Protection:** With dedicated outlets for computer, monitor and peripherals everything is safe from the threat of bad power in modern UPSs. This multipath protection provides high-performance surge suppression on both AC lines and datalines to protect computers from electrical noise and damaging power surges - even lightning.

**Internet Ready:** Protection for Fax/Modem Connection - Protects internal and external modems, motherboard and other system components with fax/modem line surge protection. With power surges capable of entering through the telephone lines, this is an important feature.

**User-renewable UPS System:** With normal use, a UPS battery will last three to six years. User-renewable UPS system eliminates the need for factory service and loss of protection by replacing batteries for a fraction of the cost of a new UPS.

**Intelligent Battery Management:** Maximizes battery performance, life and reliability with microprocessor-controlled intelligent battery management. Actively increases battery life and system reliability using FastCharge(tm) (as in the case of Back-UPS Pro) technology, automatic battery and circuitry self-tests, and advanced diagnostics.

## UPS VIS-À-VIS CVT

All CVT inadequacies are overcome by the UPS, which besides fulfilling the mandatory function of protecting against power defects like surges and sags caused by rapid fluctuation in the amplitude of the alternate current (AC), also ensures against brownouts (low voltage condition) and blackouts (no power condition).

“The fact that UPS are steadily eroding the CVT market can be attributed to a number of factors. After its initial impact on the IT industry, the CVT is fast being replaced by the off-line and line interactive UPS owing to the software

requirements of the quality of power,” says Rajnish Mathur, Instapower Ltd.

While a CVT offers protection only in case of sustained high and low voltages and

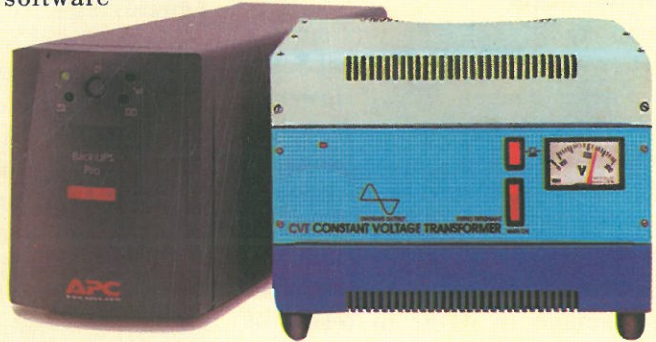
none where spikes and surges are concerned, a UPS offers both high and low voltage protection with spikes and surge protection. This hard disc corruption or failure and ensures data security.

“Though the CVT is still a good product if the application is only power hygiene, the fact that some UPS systems provide in-built CVTs removes the need to buy them separately,” says Bernard Lal, Friskars. Besides the above technical factors, market trends have also greatly contributed to the gradual phasing out of the CVT. For instance, while the prices of CVTs have remained mostly unchanged those of the UPS have steadily declined. An off-line UPS today is selling for Rs. 4975 - Rs. 6000 while a CVT is around Rs. 3000 - Rs. 3600. “With such an insignificant difference in cost, consumers naturally opt for the UPS, which provides data protection. Also with softwares like Windows 95/98. Being intolerant to sudden power cuts, even single PC users are almost forced to buy a UPS instead of a CVT,” explains Ramesh Khosla, Guard Electronic Ltd.

For manufacturers too, lower cost of production plus total sales value (revenue-wise), the UPS is a more profitable choice. Over the years, the market has seen a trend where CVT manufacturers switch over to manufacturing UPS. Having already an existing infrastructure to produce a similar product, it costs very little to include UPS in the product line.

CVT manufacturers have not recorded any gain for the last couple of years. The above phenomenon can be attributed to the sluggish growth in demand of CVTs which is a mere 5-7 per cent per annum.

Nevertheless, some industry leaders feel otherwise. There are opinions to the effect that there is no question of UPS competing with CVTs to the extent of eradicating it because both the products enjoy their unique advantages - technical as well as commercial. For instance, instrumentation and process-control industries find CVTs suitable because back up is not essential in these cases.



**Network-grade Line Conditioning:** Full time EMI/RFI filters prevent line noise from causing data errors

**Battery Drain Arrest:** Modern UPSs automatically corrects brownout conditions allowing PC users to work through brownouts without unnecessary battery drain. Also with automatic correction of overvoltage conditions allows users to work through overvoltages without unnecessary battery drain.

**Tel/Modem Protection:** Protects internal and external modems, motherboard and other system components with tel/modem line surge protection.

**Network Interface Port:** Provides the ability to coordinate a safe shutdown with most popular operating systems.

#### **Diagnostics**

**Site Wiring Fault Indicator:** This immediately warns users of wiring problems like improper grounds that could cause shocks or prevent the UPS from adequately suppressing surges. (120V units only)

**Audible Alarms:** This feature actively provides online information on the battery status, if the battery is low, or if there is an overload condition.

**Automatic Diagnostic Testing:** Periodic testing of all internal components, including the battery, ensures that the UPS is ready when needed.

#### **Power Management**

The power management software as in the case of PowerChute plus from APC enhances the reliability and manageability of your system and its data by automatically responding to power crisis situations. PowerChute plus saves data in open files, closes open applications and gracefully shuts down the operating system during extended power outages. The software performs automatic diagnostic testing and conveys critical

UPS status information in easy to read graphical displays.

PowerChute(r) plus software for Advanced UPS power management and diagnostics provides network administrators with useful UPS information and great flexibility in

configuring UPS reaction to power events. In addition to extensive unattended system shutdown, UPS testing/status, remote UPS management and environmental/power monitoring are also made available.

## **POWER MANAGEMENT INDUSTRY IN INDIA**

**T**he power management industry in India at present denotes an overall market value of Rs. 5 billion wherein the organised sector accounts for 65 per cent. A systematic segmentation of the organised UPS industry in India is based on various parameters. These are:

**Products** - there are three conventional types of UPS

(a) *The online (true UPS)* which essentially converts AC to DC power and back again into AC with the aid of an inverter that totally isolates the load, thus protecting the UPS system from direct corrupted power from the mains supply. This system gives an almost pure sine wave output and wastes no changeover time. These UPS systems have power capacities that range and from 1.5 KVA to 5 KVA in the lower end and from 15 KVA to 20 KVA in the higher end. This is also the most popular topology accounting for 60 per cent of UPS sales in India.

(b) *The off-line UPS* has a power capacity rating up to 2 Kva. They mostly deliver a quasi-sine wave output with a minimum changeover time of 3.5 milliseconds. However, there is no data loss as the hardware consists of SMTs, working on the RMS and peak voltage principles, which takes care of this changeover. Its sales in India shows a modest value of 27 per cent.

(c) *The hybrid or the Line Interactive UPS* are basically off-line units that are Ferro-resonant type using an inverter to generate either a square wave or a quasi-squarewave. The advantage of the line Interactive UPS over the off-line is that it runs

the inverter in parallel with the mains all the time. This category claims 13 per cent of the UPS sales in India.

While an on-line UPS becomes indispensable in large network environments as it can support many PCs with the aid of a CVT (Control Voltage Transformer) and achieves higher frequency stabilisation without any power loss, the off-line is the unanimous choice of single PC users the world over owing to its better economy and reliability. However, since an off-line gives only 9 per cent stabilisation, it requires a CVT to achieve greater stabilisation.

#### **Industry segmentation**

Seventy five per cent of the UPS industry in India caters to the IT and telecom sectors, while internationally, this figure is a staggering 84 per cent. As per reliable estimates, the UPS utilisation in these sectors should increase to 86 per cent by the year 2002. A mere 10 per cent of this industry caters to the process control industries while an even lower 7 per cent takes care of both the medical industry as well as mission critical installations.

#### **Market segmentation**

Available figures show that the UPS market in India is highest in the South at 40 per cent and lowest in the East at a minimal 8 per cent. Northern and Western market show a balanced 22 and 23 per cent market respectively. The PC market demands presently are growing in all businesses as well as institutional sectors at a rapid 20-25 per cent. Owing to this, the UPS



market is also expected to grow between 25-30 per cent per annum in all the major sectors.

### Market scenario

The year 1996-97 saw a tremendous slump in the UPS market. The situation at present has not seen much improvement with the overall market being in a disorganised state. Numerous reasons are cited to justify the situation. Ramesh Khosla, Director Guard Electronics, emphasises a unanimously felt need for a well functioning association. "Although we have an association called the 'UPS and Power Conditioning Manufacturers Association' based in Okhla, New Delhi, it has not received a good response from its patrons."

"With R & D expenditure being too much for individual undertaking, an association can help combine efforts of all its members and engage in R&D collectively to develop new technology and equipment. Also, if a single member gets a huge contract, he can further sub-let to other members thus reducing his work load and enhancing efficiency and profits," opines Vinay Nagar, Nagar Electronics Ltd.

Lack of consumer awareness and appropriate legislation regarding minimum performance standards further aggravates the chaotic state of this industry. The absence of codified standard for the UPS in India by a regulatory authority has resulted in a scenario where every manufacturer has his own set of specifications. Indian players feel that the legislation should also make it impossible for smuggled and imported goods to be sold in the Indian market unless they conform to the Indian standards. "Government policy, today, is such that parts and components can be imported with minimal excise and taxes. This has led to a trend wherein people are importing these parts and simply assembling them before pushing them



into the market. Also, the availability of more than 500 brands in the market can be attributed to this trend as well as to a large number of "mushroom" operations from home-based entrepreneurs. This segment prevents a proper computation of data, "In Delhi itself, there are 200-250 operators for every 10 manufacturers who are branding products and selling in cash. While their turn over actually may be around Rs. 30-40 lakhs per annum, they show a turn over of only Rs. 2-3 lakhs," says Mr. Moorthy, Kaveri Powertronics.

### MNC boom

With the advent of multinational companies, Indian manufacturers are now confronted by another source for competition besides that from the already prevalent local manufacturers. Where earlier consumers were skeptical about foreign products as they came with no service back up, they are now assured both superior technology and nation wide sales and service networks from established multinational players. These players have an edge over Indian and local manufacturers with their ability to be price-competitive due to bulk manufacturing. The multinational group includes the likes of Fiskars, Tata Liebert, American Power Conversion etc. who strive to provide quality components and warranties, which are trusted by other blue-chip companies.

Satisfactory after sales service

and quality once again are driving forces of major Indian players like Elent, Guard, Vinitec, Bhurji, Kaveri Powertronics, Nagar and others. These companies have made major in-roads into governmental institutions and consumers who covet top-of-the-line products but are reluctant to pay MNC rates. Players like Multiline, Aeon, Pheobus etc. specialise in offline lower-end UPS systems for single PC users while the fourth segment belongs to garage manufacturers who are surviving mainly because of the low prices they offer.

### The Indian approach

While MNC's have a clear strategy to stay ahead of competition with constant innovations, upgradations, new products, compact sizes and competitive prices, Indian players put primary thrust on ensuring customer satisfaction by providing reliable and efficient after sales support and other services. There is also a continuous effort to reduce servicing cost and as well as cost of materials through vendor development. "The present buyer is intelligent and understands the technology and importance of service. He has access to technological advancements the world over through the Internet. The market today is largely prevalent because of the low initial cost it projects. However, with customer education, this scenario should soon change to a healthy competition between equals," says Bernard Lal, Director Marketing, Next Generation Business Power Systems Ltd.

The Indian UPS manufacturer has an onerous task of surviving in the competitive market while constantly updating the products in terms of technology and quality. With IT finding strong roots in India, UPS would be an important component in its development and therefore it is important that the indigenous manufacturers capitalise on the growing trend and make the best use of it. ●