



# Sunlux Technologies Ltd.

Associates of PEP Modular Computers GmbH, Germany

## Projects Summary



*an ISO 9001 Company*

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## INTRODUCTION

**Sunlux Technologies Ltd.** has been in the field of Embedded Real-time Software development, Industrial Process Automation and Robotic Engineering since 1989 and has been successfully executing high precision jobs for process plants and research organizations. For prompt execution of projects, **Sunlux** has SOFTWARE and ENGINEERING activities bifurcated with relevant expertise and experienced manpower.

In the area of software development, **Sunlux** has a team of highly experienced personnel with in-depth knowledge of working on Windows-NT platform. It has generated a strong expertise on **Real Time Operating Systems** – on **OS-9/Hawk**, an RTOS that is ideally suited for high-speed data acquisition and real-time control and on **VxWorks/Tornado** another RTOS widely used in various areas like Telecom, Image Processing, Automotive Control etc.

The software development section is well equipped with high speed Pentium Server and sufficient workstations with the need of the hour INTERNET connectivity. The software tools which are extensively used are: MS VISUAL C++ 6.0, ULTRA C/C++ 3.0 for OS-9, VxWorks 5.4/Tornado 2.0, SQL Server 7.0, MS ACCESS 97, ISaGRAPH 3.32, etc. The front-end PC based MMI software used are Intellution iFix/Fix32, WONDERWARE Intouch, LABVIEW and above all, **Sunlux** specializes in tailor-made MMI / SCADA using Microsoft Visual C++ 6.0.

The hardware engineering is backed up by the vast experience of configuring the controllers of M/s **PEP Modular Computers GmbH**, of which **Sunlux** is the associated partner in India. Their powerful VME based CPUs like VM-30, VM-42, VM-62 use the Motorola 68XXX and Power PC chips and are ideally suited for High Speed Data Acquisition and Control. Protocol drivers like the ProfiBus, ModBus etc. are used for accurate and high-speed communication between PCs & the controllers.

**Sunlux** has also executed Turnkey projects and has related facilities such as Panel designing and wiring, PCB workstations, Field Instrument Simulators, Precision test jigs, Simulation Platforms, etc., all of which comply to industrial standards. AutoCAD & ORCAD stations with high-end color inkjet A0 size plotters are installed for proper documentation of the projects.

**Sunlux** has been accredited with the ISO 9001 Quality certification by TUV Rheinland

**SKILL SETS**

Real Time Operating Systems	<ol style="list-style-type: none"><li>1) Microware OS9</li><li>2) VxWorks, Windriver Systems</li><li>3) QNX – Skill set under development</li><li>4) WinCE, Microsoft Corporation</li></ol>
Non Real Time Operating Systems	<ol style="list-style-type: none"><li>1) Windows 9x/NT/2000</li></ol>
Programming Tools – RTOS	<ol style="list-style-type: none"><li>1) Microware Fastrak/Hawk V1.0 for C/C++ development on OS9</li><li>2) Tornado 2.0 with associated tools for C/C++ development on VxWorks</li></ol>
Programming Tools – Non RTOS	<ol style="list-style-type: none"><li>1) Microsoft Visual C++ 6.0</li></ol>
Hardware	<ol style="list-style-type: none"><li>1) VME Bus Systems – 68K, Intel, PowerPC</li><li>2) Compact PCI systems – Intel, PowerPC</li><li>3) Digital Signal Processors (TMS320Cxx)</li><li>4) Microprocessors – Motorola 68K, Texas MSP430Fxxx etc.</li><li>5) Micro controllers - 8051/80C535</li><li>6) PLCs</li></ol>
Other Packages	<ol style="list-style-type: none"><li>1) ISaGRAF from Altersys, Canada for IEC 61131-3 programming</li><li>2) SCADA Packages – Wonderware Intouch, Intellution iFix/Fix32</li><li>3) LabView/LabViewRT</li></ol>

## A BRIEF OF OUR CAPABILITIES

- 1) Application software development on Real Time Operating Systems (RTOS)
  - a. On "OS9", an RTOS from Microware Corporations, the software group of Radysis
  - b. On VxWorks/Tornado, an RTOS from WindRiver Systems
  - c. On QNX, an RTOS from QNX Systems Inc.
  - d. Windows CE, an embedded operating system from Microsoft
  - e. Migration to any other customer specific OS is possible
- 2) Protocol Stack development for standard protocols like TCP/IP, PROFIBUS, DNP 3.0 etc. and also any customer specific protocols on any of the OS above and also Microsoft Windows in general.
- 3) System level programming like writing device drivers etc. for the above mentioned operating systems including Windows 9x/NT/2000.
- 4) Graphical User Interface development on Microsoft Windows catering to customer specific applications
- 5) Engineering Application Software Development on Windows for data analysis
- 6) Turn Key solutions in Embedded Systems covering applications like Robotics, Supervisory Control and Data Acquisition (SCADA), Process Control, Automation etc.
- 7) Embedded Product Development/Support around specific microprocessors/ Single Board Computers (SBC's)
- 8) Embedded Software Development on hardware platforms like VMEBus, CPCI etc.
- 9) Other possibilities based on our experience of the above.

**PARTNERS ...**

- 1) **PEP Modular Computers GmbH**, Kaufbeuren, Germany – For VMEBus and CompactPCI Embedded Hardware

[www.pep.com](http://www.pep.com)

- 2) **Altersys Inc**, Canada – For ISaGRAF an IEC 61131-3 programming tool

[www.altersys.com](http://www.altersys.com)

- 3) **Unicontrols a. s.**, Czech Republic – For solutions to the Railway Industry

[www.unicontrols.cz](http://www.unicontrols.cz)

- 4) **Smart Crane LLC**, USA – For “Antisway” crane control algorithm

[www.smartcrane.com](http://www.smartcrane.com)

**OUR DISTINGUISHED CUSTOMERS ...**

<b>CLIENTS</b>	<b>AREAS OF APPLICATION</b>
M/s. Indian Space Research Organisation (ISRO), Bangalore, India	Satellite Test and Analysis Systems
M/s. Larsen & Toubro Limited, Mumbai, India	Control system for Missile Launcher
M/s. Bhabha Atomic Research Centre (BARC), Mumbai, India	Data Acquisition Systems
M/s. Tata Iron & Steel Co. Limited (TISCO), Jamshedpur, India	Process Control, Automation, Mould Breakout Detection, Slag Detection System etc. for Slab Casters
M/s. General Electric (Power Controls) Pvt. Ltd. (GEPC) , Bangalore, India	Breaker communication and management software
M/s. Pepperl + Fuchs (India) Pvt. Ltd., Bangalore, India	Remote I/O communication and management software
M/s. Nestle India Ltd., India	Automation of coffee handling
M/s. Easun Reyrolle Limited., Hosur	IEC/DNP Communication protocol stack for protection devices
M/s. Bharat Heavy Electricals Limited – Electronic Division (BHEL-EDN), Bangalore, India	DAS & Control System
M/s. Indira Gandhi Centre for Atomic Research (IGCAR), Department of Atomic Energy (DAE), Kalpakkam, India	Data Acquisition System, Multitaxis Robots, Remote Manipulators, SCADA systems, Windows NT device drivers
M/s. Indian Institute of Science, Bangalore, India	Autoclave Control System
M/s. Venlon Polyester Films Limited, Mysore, India	Process Control, Automation
M/s. Central Power Research Institute (CPRI), Bangalore, India	Adaptive controller for HVDC simulators on Texas DSP
M/s. Bharat Heavy Electricals Limited – Industrial Systems Group (BHEL-ISG), Bangalore, India	Switchyard Automation
M/s. Rare Material Plant (RMP-BARC), Mysore, India	Data Acquisition & Control System, Field Gateway Units, Communication Drivers, Inverter Panels
M/s. Centre for Advanced Technology (CAT), Indore, India	Robotics
M/s. Metazinc Ltd., Mumbai, India	Process Control

## Projects Summary

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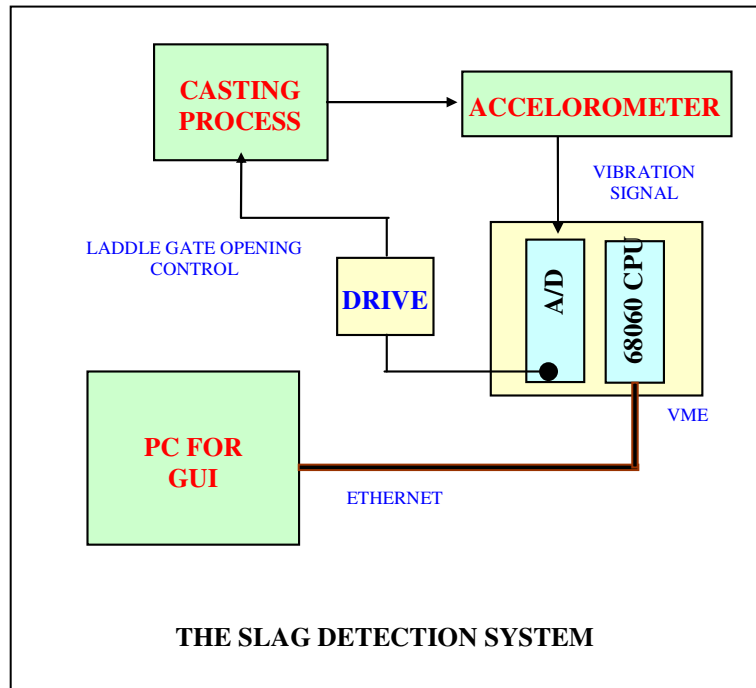
M/s. Research and Development Engineers (RDE), Pune, India, a DRDL laboratory	CompactPCI based control system, VxWorks
M/s. Bharat Heavy Electricals Limited – Corporate Research & Development (BHEL-R&D), Hyderabad, India	ISaGRAF PRO, CPCI etc.



## **SOME OF OUR IMPORTANT PROJECTS ...**

The following section briefly describes some of the many projects Sunlux has implemented over the years. Though it is not feasible to include all the projects in the document, an attempt has been made to include one project from the different areas in which Sunlux has expertise. The section also highlights the tools and technologies used in the implementation of the projects.

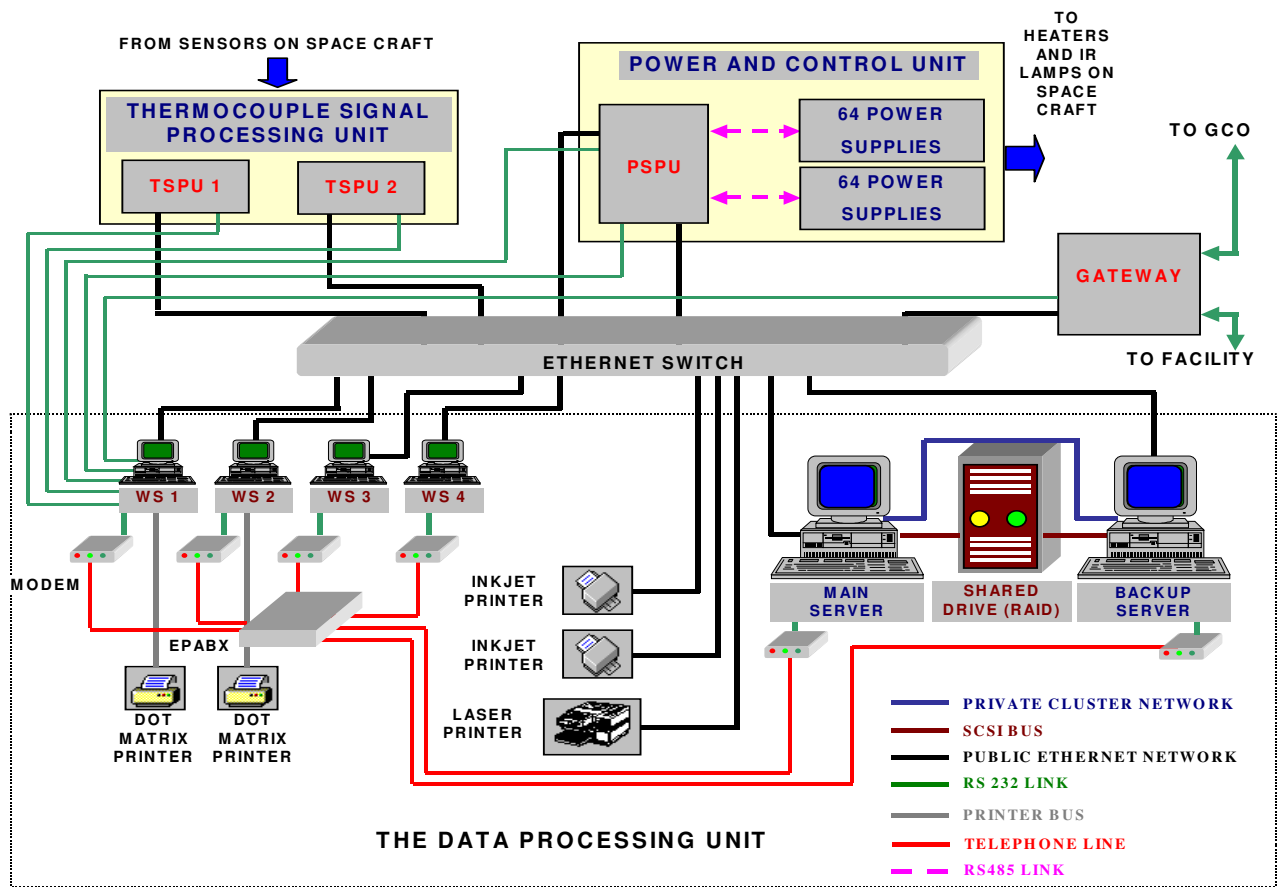
<b>PROJECT</b>	<b>SLAG DETECTION SYSTEM FOR STEEL PLANTS</b>
<b>SOFTWARE PLATFORM</b>	Microsoft Windows 95/NT 4.0, Microware OS9 3.0
<b>SOFTWARE TOOLS</b>	Microware Hawk V 1.0 & Ultra C/C++ 3.0, Microsoft Visual C++ 6.0, Microsoft SQL Server 6.5
<b>HARDWARE PLATFORM</b>	Motorola 68060 based CPU on VME System from PEP Modular Computers, Intel Based Pentium II
<b>WORK EFFORT</b>	- 3 Man-months on OS9 3.0 using Ultra C/C++ 3.0 for implementation of Slag Detection Algorithm - 4 Man-months for GUI development and real-time plot - 15 Man-days for Database design and implementation on MS SQL Server 6.5
<b>DESCRIPTION</b>	The Slag Detection System is a real-time control system that is used in Steel Plants for detection of Slag in the molten metal during the casting of steel. The Slag is the layer of impurity that floats on top of the molten metal and must be prevented from mixing into the steel during steel casting to maintain the quality of the steel. The vibration level of the metal flowing through the Ladle opening is different for pure metal and for Slag. An accelerometer is used as sensor for vibration level measurement. This signal fed to the VME controller for high-speed acquisition and analysis. The system has some digital I/Os for interlocks and Ladle Gate opening control. The level of opening of the Ladle Gate determines the quality of the Steel.
<b>FEATURES</b>	<ul style="list-style-type: none"> <li>• Mathematical Analysis Model running on the OS9 for Slag detection.</li> <li>• Local Buffering of data on Dual Ported Ram on the VDSP</li> <li>• Closed-loop drive control for opening and closing of the Ladle Gate for Quality Steel production.</li> <li>• System synchronization by real-time operating system OS9.</li> <li>• Communication with PC for Graphical Data Analysis over Ethernet using Modbus protocol.</li> <li>• Online Data Analysis and Historical Data Logging into a SQL Server Database for offline analysis of acquired data.</li> </ul>
<b>CUSTOMER</b>	Tata Iron and Steel Company (TISCO), Jamshedpur
<b>STATUS</b>	Commissioned



<b>PROJECT</b>	<b>DATA ACQUISITION AND CONTROL SYSTEM FOR SPACE SIMULATION CHAMBERS</b>
<b>SOFTWARE PLATFORM</b>	Microsoft Windows 95/NT, Microware OS9
<b>SOFTWARE TOOLS</b>	Microware Hawk V1.0 with Ultra C/C++ 3.0, Microsoft Visual C++ 6.0, Microsoft Visual Basic 6.0, Microsoft SQL Server 6.5, Wonderware Intouch 6.0b
<b>HARDWARE PLATFORM</b>	Motorola 68060, 68040 and 68360 based CPUs on VME System from PEP Modular Computers, Intel Pentium II based Compaq Servers and Intel Pentium MMX based Workstations
<b>WORK EFFORT</b>	20 Man-months on OS9 using Ultra C++ for Data Acquisition and Control Software 25 Man-months for GUI development mainly in MS VC++ and also in Wonderware Intouch 6.0b. 10 Man-months for Database design and implementation on MS SQL Server 6.5 and Historical Data Analysis software on Visual Basic 6.0
<b>DESCRIPTION</b>	<p>This control system is basically used for artificially generating space conditions in a closed chamber in which satellites are tested for their performance prior to their launch into outer space. The system has mainly four subsystems, each catering to different functions:</p> <ul style="list-style-type: none"> <li>• The <b>Data Processing Unit (DPU)</b> is the central part of the system where all the data collected by the various sub-systems are concentrated. The DPU continuously logs the acquired data into a MS SQL Server 6.5 database for offline processing. Besides this the DPU forms the main user interface for the entire system from which the user configures the system, controls the various sub-systems, monitors the health of the sub-systems, performs both online as well as offline data analysis etc. The DPU consists of two Compaq Servers, one used as the Main Server and the other used as the Backup Server to take over the system operation in case of failure of the Main Server. There is a RAID where the system stores all the data common between the Servers. Windows NT Cluster Kit manages the redundancy of the Servers. Besides there are four Digital Workstations which are used only for data monitoring and performing data analysis. These Workstations connect to the Servers using NetDDE to get data.</li> <li>• The <b>“Thermocouple Signal Processing Unit”</b></li> </ul>

	<p><b>(TSPU)</b> acquires temperature data from 512 T-type thermocouples, performs Engineering unit conversions on the data and sends these data to the Servers using Modbus on Ethernet. The TSPU is based on Motorola 68040 CPU VME Systems running control software developed in Ultra C/C++ on RTOS OS9.</p> <ul style="list-style-type: none"> <li>• The “<b>Power Supply Signal Processing Unit</b>” (<b>PSPU</b>) controls and acquires data from 128 programmable power supplies. The power supplies are multi dropped on a RS485 bus in groups of 16 power supplies each in a Master Slave configuration. The PSPU acts as a Master while each of the power supplies act as Slaves and are assigned unique slave addresses. A Micro controller Card is used to acquire the parameters like Voltage, Current and fault signals like over voltage, over current, over temperature, output relay status etc. and transmit it back to the PSPU. The setting of the voltage of each power supplies and also the output relay (ON/OFF) is remotely controlled by the PSPU with the RS485 interface running at 19.2 Kbps. These power supplies inturn heat various heating elements like IR lamps and skin bound heaters to control the temperature inside of different parts of the satellite. A maximum of 128 self-tuning closed loops can be run in the PSPU to automatically maintain the set temperatures. The PSPU also uses the Modbus protocol to communicate with the Servers. The PSPU is based on two Motorola 68060 CPUs VME Systems running control software developed in Ultra C/C++ on RTOS OS9. The two CPUs are used in a multiprocessor configuration so that one CPU acts as a standby in case of failure of the other.</li> <li>• The “<b>Gateway</b>” is based on a lower end Motorola MC68360 CPU based system and acts as a “gateway” between the Satellite and the Data Acquisition and Control system. The main function of the Gateway is to buffer the data sent by the satellite, do some engineering unit conversions on these data and pass it on to the Servers. The Gateway control software also runs OS9 and uses the Modbus protocol for communicating with the Servers.</li> </ul>
<p><b>FEATURES</b></p>	<ul style="list-style-type: none"> <li>• A Distributed Control System for independent handling of functions to increase reliability.</li> <li>• Acquisition of 973 Temperature channels with</li> </ul>

	<p>accuracy of +/-0.5°, 128 voltage channels with +/- 300mV accuracy, 128 current channels with +/- 100mA accuracy, 6 digital status signals from each of 128 power supplies, 2 vacuum level channels, 2 Quartz Crystal Monitoring channels.</p> <ul style="list-style-type: none"> <li>• Powerful Client Server architecture.</li> <li>• Adequately redundant system with Windows NT Cluster based redundancy at the Server level for data storage and control as well as CPU level in the PSPU for closed loop control of the power supplies.</li> <li>• MS SQL Server 6.5 for data storage.</li> <li>• Self-tuning closed loop temperature control.</li> <li>• Extensive report generation facility to meet the high degree of documentation necessary for space applications.</li> <li>• Micro controller based power supply to take care of data acquisition, control and RS485 network. A custom protocol runs on the RS485 network.</li> <li>• A powerful customized software package for online and offline data analysis.</li> <li>• A complete telephone exchange facility between the Servers and the Workstations for recording of messages between operators to create an event database.</li> </ul>
<b>CUSTOMER</b>	Indian Space Research Organisation (ISRO), Bangalore
<b>STATUS</b>	Commissioned (three satellites, the IRSP4, INSAT 3B and GSAT have already been tested on this system). Based on the performance of this system Sunlux has received a repeat order for a similar system at a much larger scale. The new system is under installation presently.



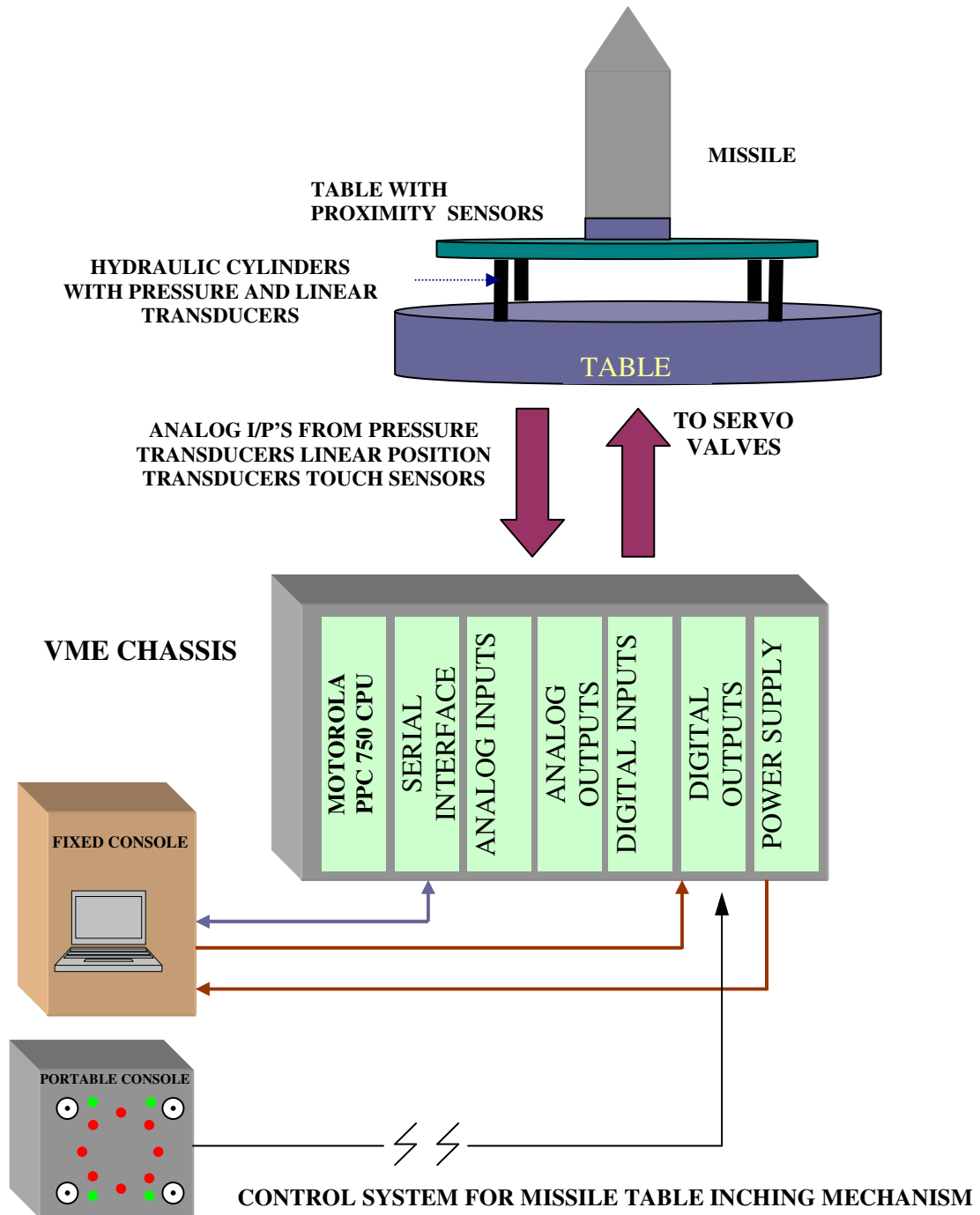
**SYSTEM CONFIGURATION OF THE DATA ACQUISITION AND CONTROL SYSTEM FOR 4M THERMOVACUUM CHAMBER**

<b>PROJECT</b>	<b>CONTROL SYSTEM FOR MISSILE LAUNCH TABLE</b>
<b>SOFTWARE PLATFORM</b>	Microsoft Windows 2000, VxWorks 5.4
<b>HARDWARE</b>	Motorola Power PC 750 based VME Bus Controller from Motorola (MVME series), I/O boards from VMIC, USA
<b>SOFTWARE TOOLS</b>	Tornado 2.0 development system, Tornado 2.0 tools like WindView, Debugger etc.
<b>SOFTWARE EFFORT</b>	4 Man-months of development on C using the Tornado IDE
<b>PROJECT DETAILS</b>	<p>The system is a Real-time Embedded Controller running VxWorks for controlling the loading/unloading and stabilization of a missile on its launch table prior to its launch on w war-ship. The goal of this project is to develop real-time control system to automate the operations of the “Table Inching Mechanism” a mechanical system with a table top on which the missile is placed prior to launch and four hydraulic cylinders which form the four supporting structures for the missile launch table. The control system performs all actions to ensure that the missile once loaded is perfectly vertical to its plane of launch.</p> <p>The basic functions of the system are to perform the operations of raising/lowering the table on which the missile will be loaded. This raising/lowering operation of the table is done with or without the missile using servo valves. These operations are done in a controlled manner by implementing the various interlocks.</p> <p>The controller has the requisite analog I/P O/P, digital I/P O/P cards to read the user/analog inputs and control the table lifting cylinders. Embedded software logic such as the PID control, filtering logic, interlock logic etc are built on it. The portable console is used to give gang commands such as table raise/lower to the controller. The portable console is also used to inch individual cylinder up/down. Also there are some commands such as the emergency stop from the portable console. The fixed console has all the commands/display facility of portable console. Additionally, it has an LCD display and keyboard to show and accept various parameters/commands respectively. The controller reads the output of the linear position transducers, which is used as an input to control the servo valves.</p>
<b>FEATURES</b>	<ul style="list-style-type: none"> <li>• Real-Time, fully embedded software</li> </ul>



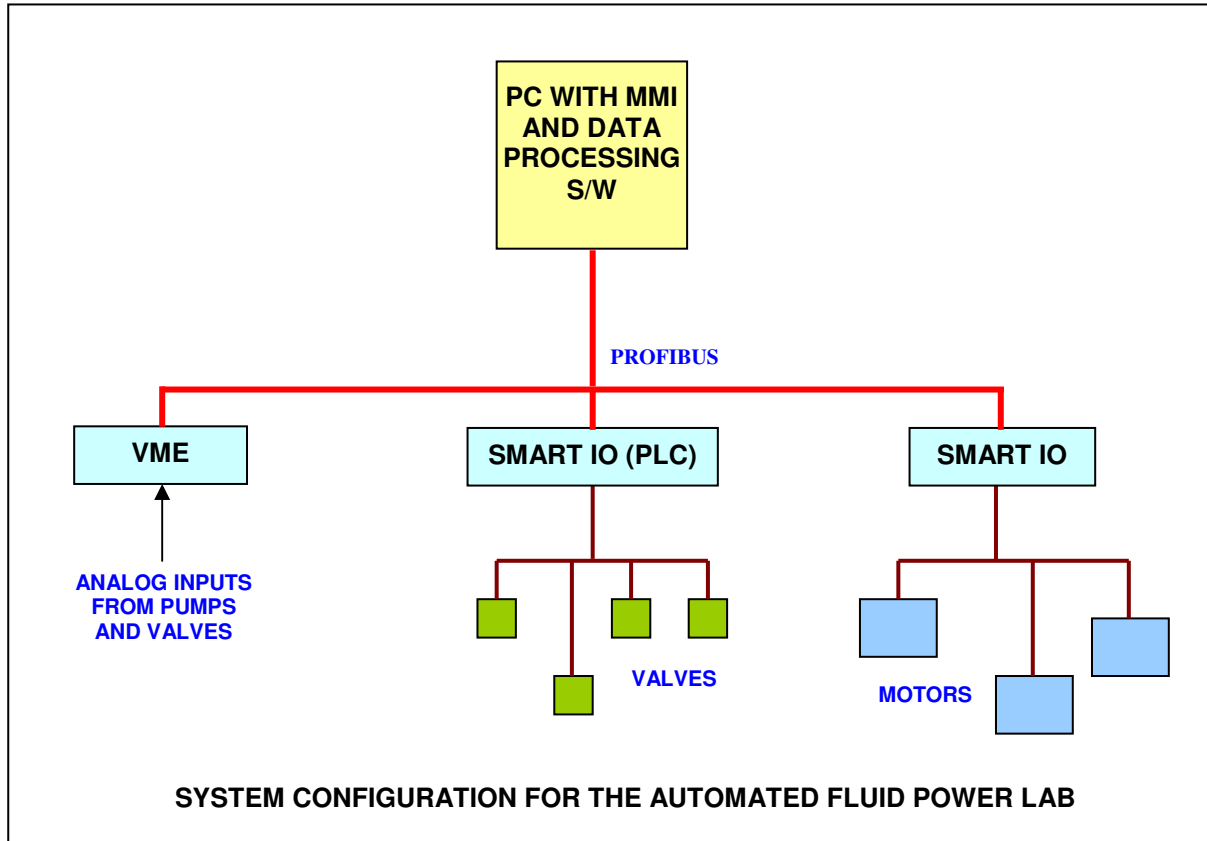
Projects Summary

	<ul style="list-style-type: none"> <li>• Closed loop control of proportional valves</li> <li>• Designed for a highly reliable operation using features like hardware watch dog timers etc.</li> </ul>
<b>CUSTOMER</b>	Larsan and Toubro Limited, Heavy Engineering Division, Mumbai
<b>STATUS</b>	Development/Testing/Validation Complete, Installation pending



<b>PROJECT</b>	<b>AUTOMATION OF FLUID – POWER LAB FOR TESTING OF VALVES, PUMPS FOR NUCLEAR APPLICATION</b>
<b>SOFTWARE PLATFORM</b>	Microsoft Windows 95, OS-9 Ver 2.1
<b>HARDWARE</b>	Intel 486 Based PC, VME SYSTEM, SMART I/O System (PLC System), Signal Conditioners
<b>SOFTWARE TOOLS</b>	Microware Fastrak with Ultra C, Visual Basic Ver 4, Intellution Fix 32, LabView Ver 3, ISaGRAF 3.0 (PLC Programming Language)
<b>SOFTWARE EFFORT</b>	4 Man-months of development on Ultra C 2 Man-months of development on MS Visual Basic 4.0 3 Man-months of development on Intellution for MMI and control 1 Man-month of development on IsaGRAF
<b>PROJECT DETAILS</b>	The system is built on PC based Man Machine Interface, VME based fast Data Acquisition system, SMART I/O based interlocks and control system. The system is being used for, Motor test facility, Cylinder test facility, Servo valve and Servo actuator test facility, Filter test, Pumps and their control, Water hydraulic valve test etc. The system features “mimics” for different test facility for process visualisation. The system is flexible so as to enable the user to program details of every test. The Data Acquisition was implemented with the VME and SMART I/O system from PEP Modular Computers working on Real-Time Operating System OS-9. The data acquired is compatible with LabView and can further be analyzed with it. The system is suitable for Static as well as Dynamic tests. The project has been executed on a turnkey basis with hardware, software and application development including erection and commissioning.
<b>FEATURES</b>	<ul style="list-style-type: none"> <li>• A Distributed Control system with PC as MMI, VME as data acquisition SMART I/O for Data Acquisition and interlock.</li> <li>• MMI based on Intellution and MS Visual Basic 4.0</li> <li>• Control and interlock software based on ISaGRAF IEC 1131 standard software with: Functional Block Diagram Ladder Diagram Instruction Set C-Function</li> <li>• Data Acquisition System built with OS-9 RTOS for 333 Kilo sample data collection.</li> <li>• Data analysis on Labview for Fast Fourier Transform,</li> </ul>

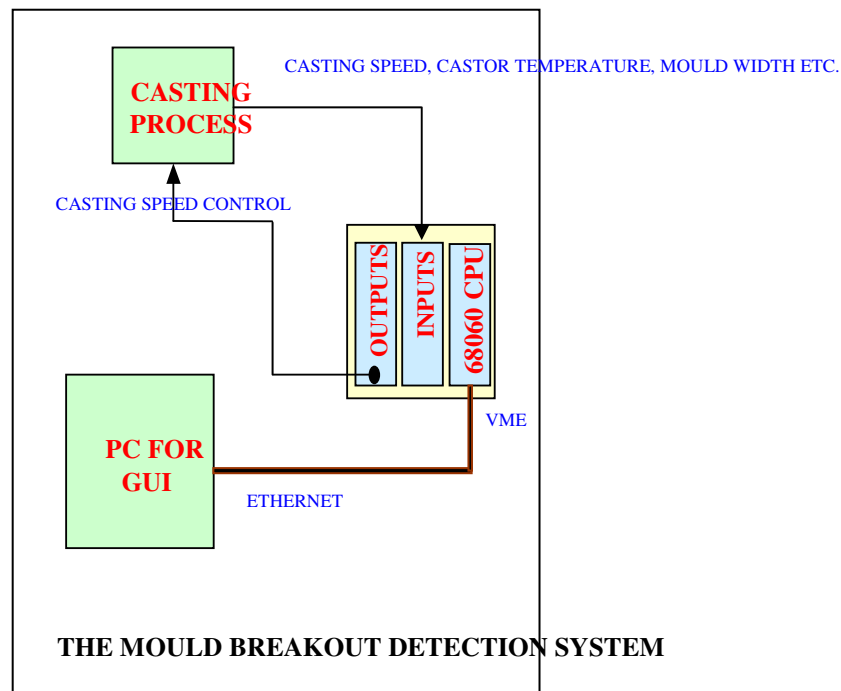
	Power spectrum and Pulse Parameter Digital Filters
<b>CUSTOMER</b>	Bhabha Atomic Research Center (BARC), Bombay
<b>STATUS</b>	Commissioned and operating successfully



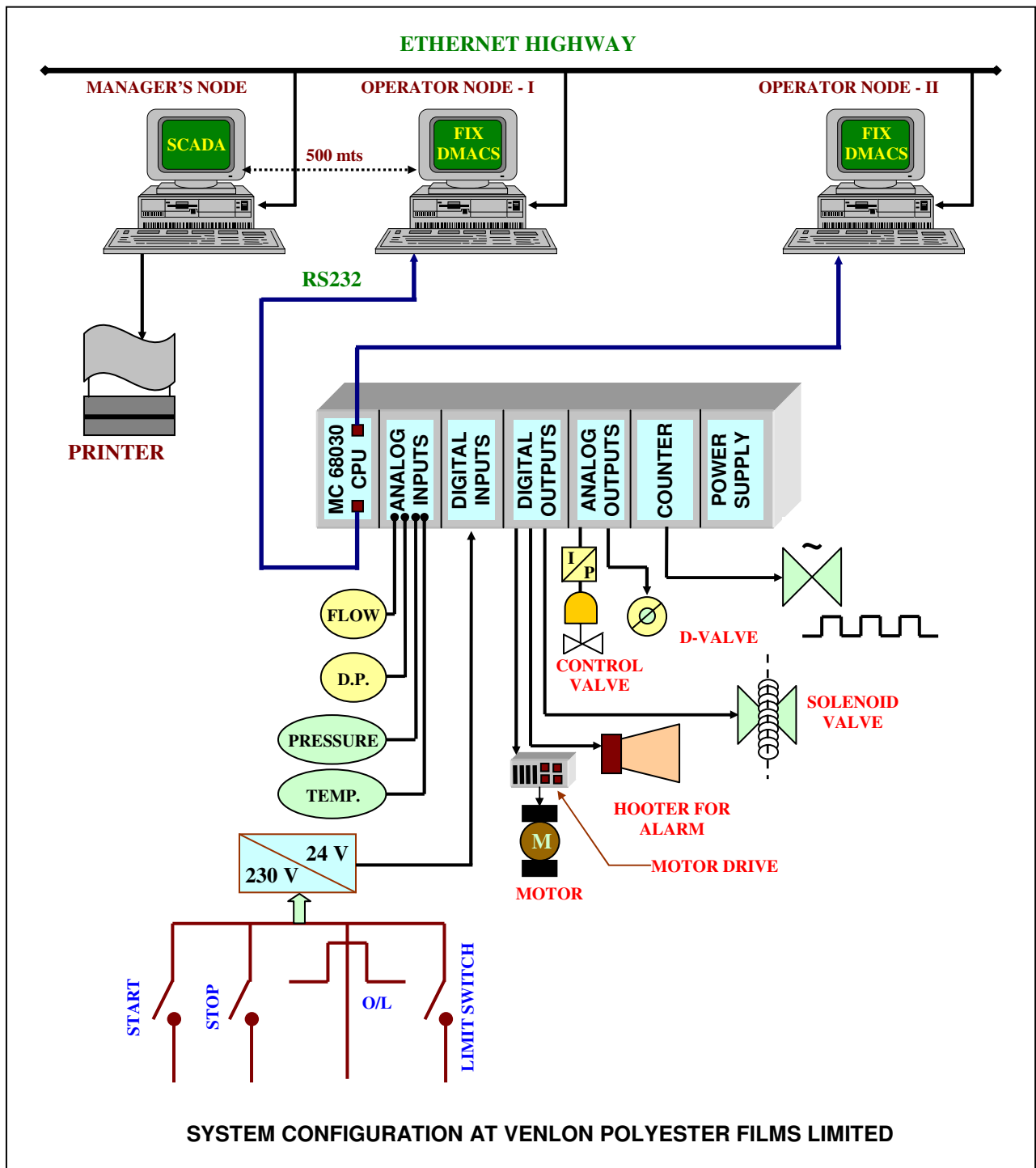
<b>PROJECT</b>	<b>MOULD BREAKOUT DETECTION SYSTEM FOR STEEL PLANTS</b>
<b>SOFTWARE PLATFORM</b>	Microsoft Windows NT 4.0, OS-9 Ver 3.0
<b>HARDWARE</b>	Intel Pentium 266 MHz Based PC, MC 68060 based VME System, Analog and Digital I/Os
<b>SOFTWARE TOOLS</b>	Microware Fastrak with Ultra C/C++, MS Visual C++ Ver 6.0, Intellution Fix32, MS Visual Basic 4.0
<b>SOFTWARE EFFORT</b>	4.5 Man-months of development on Ultra C/C++ 2 Man-months of development on Intellution for MMI 1 Man-months of development on MS Visual Basic 4.0 1 Man-months of development on MS Visual C++ 6.0
<b>PROJECT DETAILS</b>	<p>The Client is a mammoth Steel Plant and is an international player in the manufacturing of quality steel. The problem – loss to the tune of Indian Rs. 25 lakhs for every “breakout” that occurs, with about ten breakouts occurring every year per caster. A “breakout” in a steel plant occurs when, during the steel casting process, molten metal sticks to the surface of the caster instead of flowing smoothly out of the caster. The system is a Data Acquisition and Control System meant to detect the possibility of “breakout” and immediately slow down the casting process to allow the molten metal to cool properly.</p> <p>To detect the occurrence of the breakout, the system acquires many signals like casting speed, caster surface temperature etc. and runs an algorithm to determine whether breakout has occurred or not. Based of this decision it activates some digital and analog outputs to bring down the casting speed. The software for the data acquisition and control including the algorithm execution has been written in Ultra C++ and runs on the Real-Time Operating System OS9.</p> <p>The execution of the algorithm, acquisition of data, breakout detection can be visualized on the PC. The process visualization software is partly developed using Intellution and partly in MS VC++ 6.0. This software also generates online alarms against set limits and has provision to log acquired data and trend it at a later time. Communication between the PC and the VME is done through the MODBUS protocol over Ethernet.</p>
<b>FEATURES</b>	<ul style="list-style-type: none"> <li>• Highly reliable embedded system for Data Acquisition and Control that can successfully run even in case of failure of the MMI PC</li> <li>• Process Visualization for efficient monitoring of the</li> </ul>

## Projects Summary

	<p>system operation</p> <ul style="list-style-type: none"> <li>• Real-time Operating System (OS9) used ensures timely execution of critical detection code</li> <li>• Operational in a Steel Plant where it is saving Rs 2.5 crores/year – an amount five times the cost of the system</li> </ul>
<b>CUSTOMER</b>	Tata Iron and Steel Company (TISCO), Jamshedpur
<b>STATUS</b>	Commissioned and operating successfully

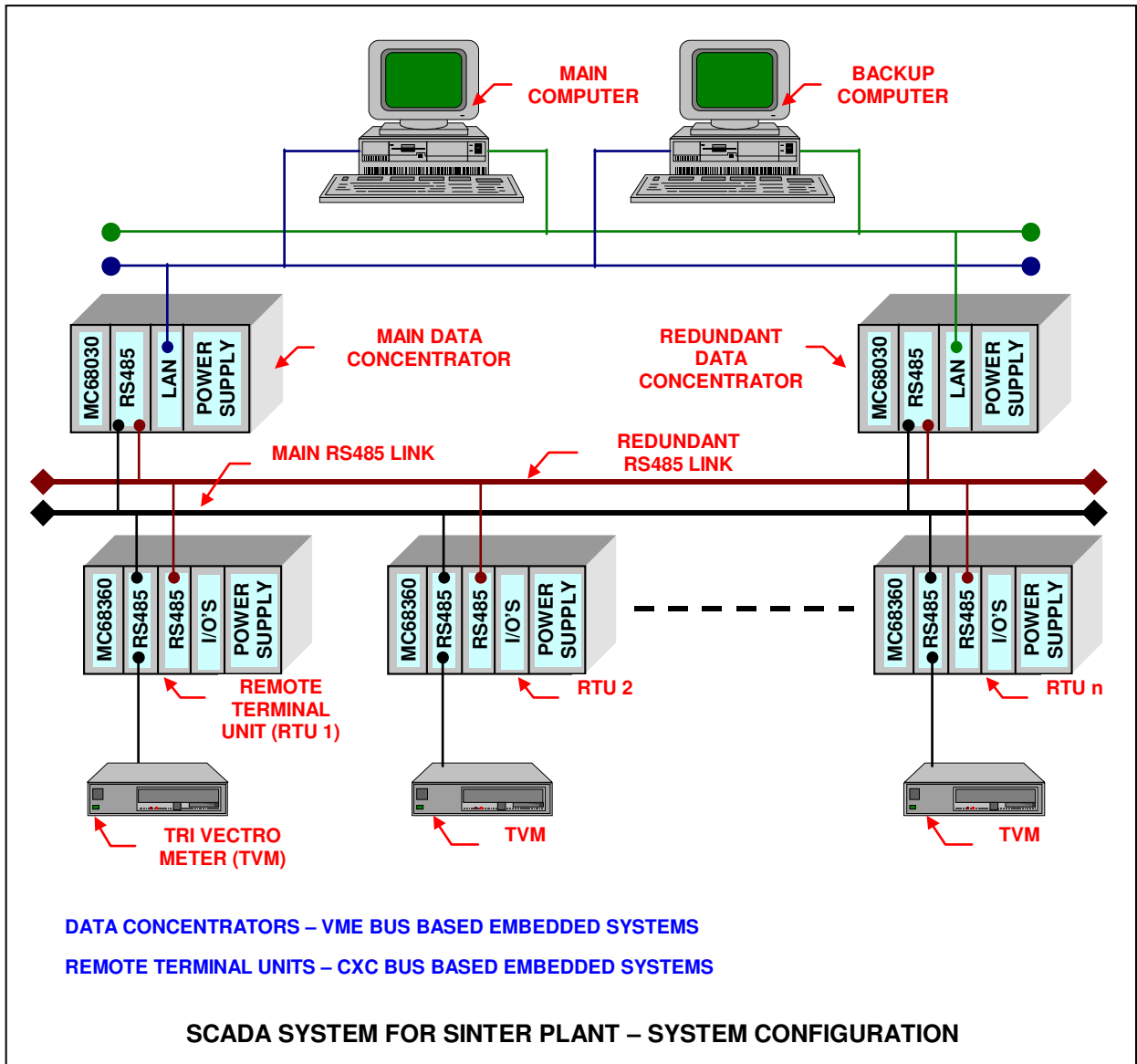


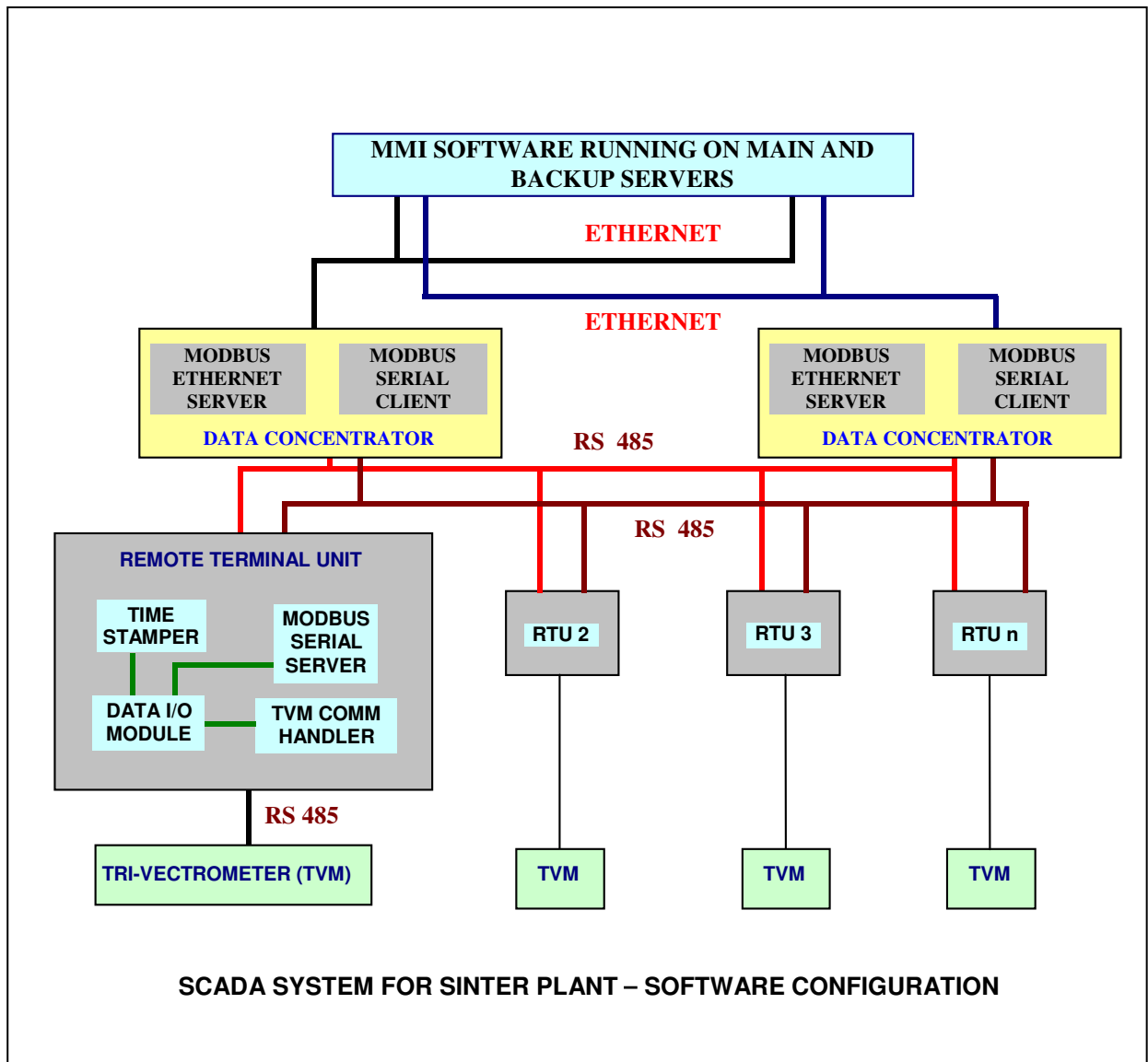
<b>PROJECT</b>	<b>DATA ACQUISITION AND CONTROL SYSTEM FOR POLYCONDENSATION</b>
<b>SOFTWARE PLATFORM</b>	Microsoft Windows 95, OS-9 Ver 3.0
<b>HARDWARE</b>	Intel 486 Based PC, MC 68302 based PLC System, Analog and Digital I/Os
<b>SOFTWARE TOOLS</b>	ISaGRAF V3.23, Intellution Fix32
<b>SOFTWARE EFFORT</b>	1.5 Man-months of development on ISaGRAF V3.23 1 Man-month of development on Intellution
<b>PROJECT DETAILS</b>	<p>The system is used for controlling the Chemical process called Polycondensation. The process envisages conversion of 2 main ingredients namely DMT and Ethylene Glycol. The Process has an Autoclave, which has 5 closed loop operations including Vacuum, Pressure and Flow. All the respective signals are conditioned and fed into the embedded controller and processed. The related control logic is embedded and controls the entire process. The Programming language used is ISaGRAF, which conforms to IEC 1131-3 Standards.</p> <p>The processed signal is then in turn routed via RS232 Serial link to the Operator Stations 1 and 2. The Protocol used for Communication between the embedded controller and Operator Stations 1 and 2 is MODBUS. The Operating Stations 1 and 2 have MS Windows 95 as the Operating System and Man Machine Interface Package from Intellution is used for total plant control, Data Acquisition and process visualisation. The 2 Operator Stations are linked to a remote station via Ethernet for Reporting and operate in a redundant mode so that the second operator station takes over the first in case of failure of the first.</p>
<b>FEATURES</b>	<ul style="list-style-type: none"> <li>• Real-time, embedded cost effective solution</li> <li>• Capable of closed loop control</li> <li>• Complete plant control and monitoring with animated graphics</li> <li>• System designed for effective fault recovery because of redundant operator stations</li> </ul>
<b>CUSTOMER</b>	Venlon Polyesters
<b>STATUS</b>	Successfully commissioned and running for years



<b>PROJECT</b>	<b>SCADA SYSTEM FOR SINTER PLANT</b>
<b>SOFTWARE PLATFORM</b>	Microsoft Windows NT 4.0, OS9 Ver 3.0
<b>HARDWARE</b>	MC68030 and MC68360 based VME Systems, Intel based PC for Visualisation, Trivectrometers
<b>SOFTWARE TOOLS</b>	Microware Fastrak with Ultra C/C++, Intellution Fix32
<b>SOFTWARE EFFORT</b>	3 Man-months of development on Intellution 5 Man-months of development on Ultra C++
<b>PROJECT DETAILS</b>	<p>The system is a Supervisory Control and Data Acquisition system for close monitoring of operations of various substations of a steel plant. The system is intended to be used to localize the cause of fault when a series of electrical gadgets trip in a large electrical network. In such situations, it is important to know which of the several nodes in the network caused the fault. The detection of the faulty node is done by closely monitoring the state of the nodes at a very high rate. Thus all the nodes in the circuit is Time Stamped for change of state every 1 millisecond.</p> <p>Since a single system will not be able to time stamp huge number of plant parameters at such high frequency, the system has been designed as a Distributed Control System. "Remote Terminal Units" (RTU's) are used for different load centers having necessary Digital and Analog modules. Besides these Digital and Analog modules, the RTU's also acquire data over RS485 serial link from a number of TriVectrometer. The time stamped data is then sent to the PC for data analysis over Ethernet network.</p> <p>The system has a pair of redundant SCADA servers and gateway controllers. The redundant server units have On-line data base duplication mechanism to ensure data integrity during switchover.</p> <p>The MODBUS communication driver has been used for linking various modules.</p>
<b>FEATURES</b>	<ul style="list-style-type: none"> <li>• Suitable for large plants with complex electrical networks</li> <li>• Uses a Distributed Control System</li> <li>• High rate of time stamping of data ensures foolproof operation</li> </ul>
<b>CUSTOMER</b>	Bhilai Steel Plant, Bhilai
<b>STATUS</b>	Final Stages of Commissioning

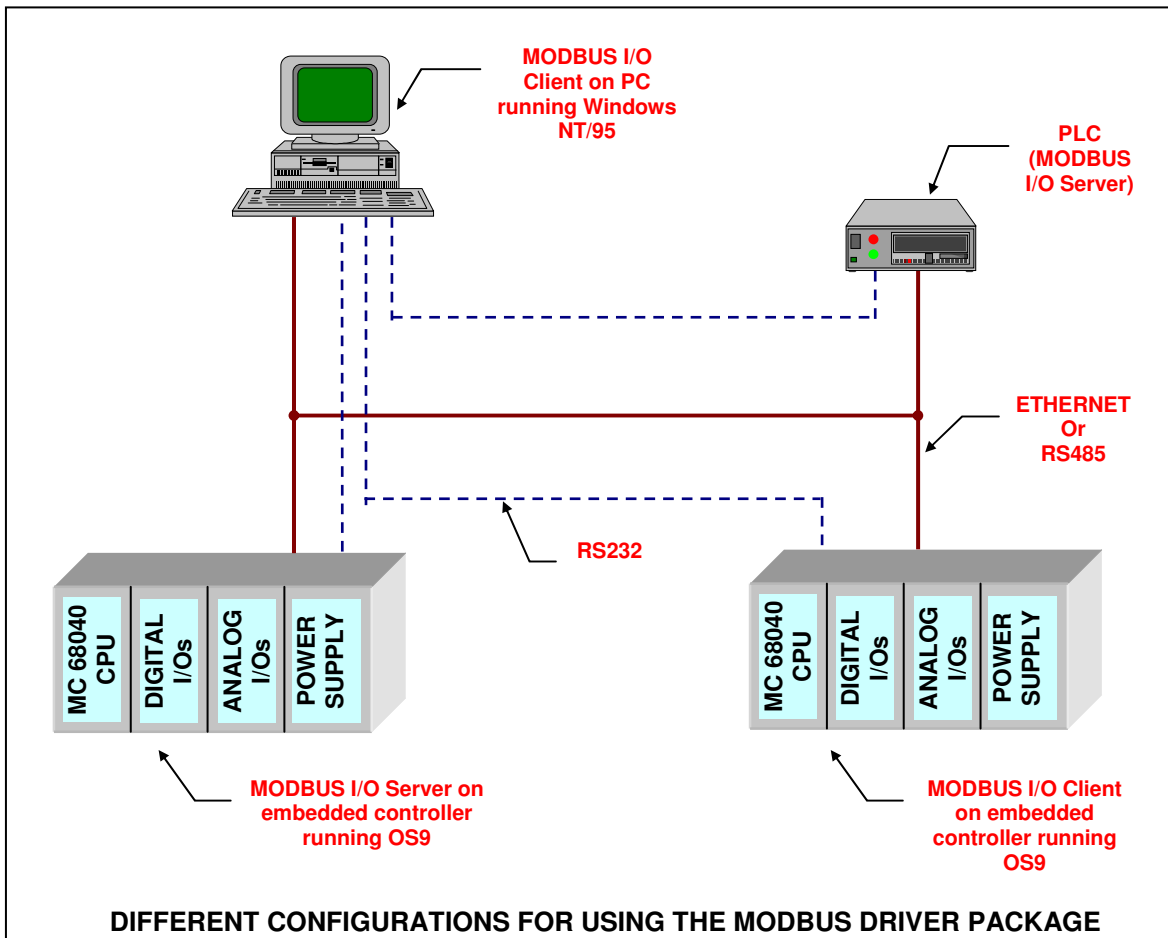






<b>PROJECT</b>	<b>MODBUS COMMUNICATION DRIVER</b>
<b>SOFTWARE PLATFORM</b>	Microsoft Windows NT 4.0/ Microsoft Windows 95/98, OS-9 Ver 3.0
<b>HARDWARE</b>	Intel Pentium Based PC, MC 68K based VME System
<b>SOFTWARE TOOLS</b>	Microware Hawk V1.0 for Ultra C/C++, MS VC++ Ver 6.0
<b>SOFTWARE EFFORT</b>	3.5 Man-months of development on Ultra C/C++ 2 Man-month of development on MS Visual C++ 6.0
<b>PROJECT DETAILS</b>	<p>MODBUS is a standard industrial protocol used for communication with MODBUS supporting devices like PLCs etc. Using this package one can hook GUI application programs to PLCs for real-time data exchange. This package is particularly suitable for SCADA applications which need to communicate with PLCs for data acquisition and control. This package consists of the following components:</p> <ul style="list-style-type: none"> <li>⇒ <b>MODBUS I/O Server for OS9:</b> This component which runs on OS9 is a MODBUS Slave (Server) and can service requests from MODBUS clients. This component is intended to be used on embedded systems which need to transfer data to the PC for process visualisation.</li> <li>⇒ <b>MODBUS I/O Client for OS9:</b> This component which runs on OS9 is a MODBUS Master (Client) and can hook on to a MODBUS Slave for data transfer. This component is intended to be used on embedded systems which need to communicate with other embedded systems or to a PC.</li> <li>⇒ <b>MODBUS I/O Client for Windows NT and 95:</b> This component which runs on OS9 is a MODBUS Master (Client) and can hook on to a MODBUS Slave for data transfer. This component is intended to be used on PCs which need to communicate with embedded systems for data acquisition or control.</li> </ul> <p><b>NOTES:</b></p> <ul style="list-style-type: none"> <li>▪ All the components are available for RS232, RS485 and Ethernet connectivity.</li> <li>▪ All the components support unlimited number of data transfer variable limited only by the system memory and power.</li> <li>▪ Source code of all components is available on request for further customisation.</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Customisation for specific applications like porting to other operating systems will be taken up on request</li> </ul>
<b>FEATURES</b>	<ul style="list-style-type: none"> <li>• Complete solution for effective communication and data transfer between systems using different platforms.</li> <li>• Follows the standard MODBUS protocol supported by most of the available PLCs.</li> <li>• Useful in SCADA systems with embedded controllers</li> <li>• Available for different connectivity</li> <li>• Easy to use and customize</li> <li>• Source code available</li> <li>• Modbus I/O Server on OS9 is compatible with MODBUS clients available from standard MMI Packages like <b>Intellution</b> and <b>Intouch</b></li> <li>• Successfully running in many locations like ISRO-Bangalore, TISCO-Jamshedpur, BARC-Bombay, IGCAR (DAE)-Kalpakkam, etc.</li> </ul>
<b>CUSTOMER</b>	Product
<b>STATUS</b>	The package is ready to use.



<b>PROJECT</b>	<b>DEVICE DRIVERS IN WINDOWS NT/2000/ 9x, RTOS</b>
<b>SOFTWARE PLATFORM</b>	Microsoft Windows NT 4.0/ Microsoft Windows 95/98 for Windows based drivers and OS9/VxWorks etc. for real-time OS based drivers.
<b>HARDWARE</b>	Intel Pentium Based PC, PC Based Add on Cards, VME systems, CPCI systems
<b>TARGET HARDWARE</b>	ADCs, DACs, TIMERS, COUNTERS, DIGITAL I/O Cards etc.
<b>SOFTWARE TOOLS</b>	MS Visual C++ Ver 6.0, Platform SDK, Device Driver Kit, Kernel Debugger, Windows NT (free/checked versions) for Windows based drivers and associated cross development tools for the RTOS based drivers.
<b>SOFTWARE EFFORT</b>	Depends on the actual hardware. In general we have put in an effort of about 25 man-days per add on card for complete development of the card from study to installation
<b>PROJECT DETAILS</b>	<p>The drivers for the entire range of target add-on cards for personal computers and VME based industrial computers.</p> <p>The Windows NT based drivers are “kernel mode” drivers. i.e. work in the similar manner as the drivers for many classes of PC cards that are shipped with Windows NT/9x installation. For each card a supporting Dynamic Linking Library will be available to provide applications with APIs to invoke the PC card specific actions without any knowledge of accessing and communicating in lower level about the underlying hardware. The drivers are compatible with ISA and PCI buses.</p> <p>The other class of drivers viz. drivers for real-time operating systems have been written with due consideration for real-time features so as to achieve optimum response time for device actions.</p> <p><b>NOTES:</b></p> <ul style="list-style-type: none"> <li>▪ All the components of Windows based drivers are available for Windows NT 4.0 and Windows 9x onwards.</li> <li>▪ Source code of all components is available on request for further customisation.</li> <li>▪ Customisation for specific applications like porting to other operating systems will be taken up on request.</li> </ul>
<b>FEATURES</b>	<ul style="list-style-type: none"> <li>• Source code available</li> <li>• Successfully running in many locations like IGCAR (DAE)-Kalpakkam, etc.</li> </ul>

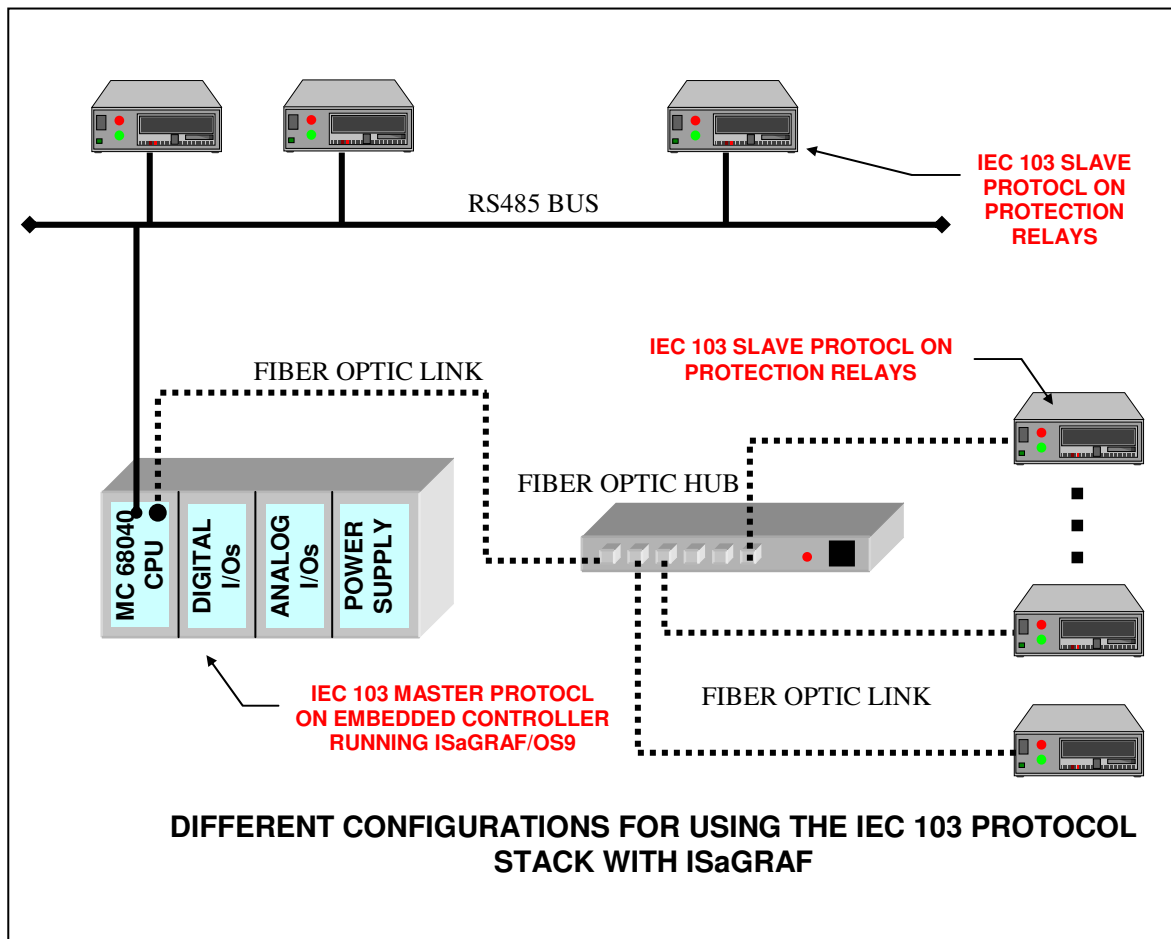
## Projects Summary

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<b>CUSTOMER</b>	Product
<b>STATUS</b>	The package is ready to use and development for any hardware will be taken up on request.

<b>PROJECT</b>	<b>IEC 870-5-103, DNP3.0 COMMUNICATION DRIVER</b>
<b>SOFTWARE PLATFORM</b>	OS-9 Ver 3.0, Windows 2000
<b>HARDWARE</b>	VME Bus System
<b>SOFTWARE TOOLS</b>	Microware Hawk V1.0 with Ultra C/C++, MS Visual C++ Ver 6.0, ISaGRAF V3.32
<b>SOFTWARE EFFORT</b>	2 Man-months of development on Ultra C/C++ 0.5 Man-month of development on MS Visual C++ 6.0
<b>PROJECT DETAILS</b>	<p>IEC 103 is a communication standard for interfacing Protection Equipment with Realtime Controllers on Fibre Optic/RS232 or a RS485 link. It is commonly used for communicating between Protection Relays and Bay controllers in Sub-station Automation systems.</p> <p>This project involves porting of the IEC 103 Source Code Library (SCL) from Triangle Micro Works Inc, USA (TMW) on OS9 operating system and also interfacing this ported protocol stack with the ISaGRAF programming package.</p> <p>ISaGRAF itself is a package for programming control systems as per the IEC 61131 programming languages. The package is developed by CJ International, France.</p> <p>The total package consists of five components –</p> <ol style="list-style-type: none"> <li>1) ISaGRAF</li> <li>2) SCL Database Interface</li> <li>3) IEC SCL</li> <li>4) SCL physical layer interface</li> <li>5) SCL configurator.</li> </ol> <p>Out of these components (1) and (3) are third party components and the rest have been developed at Sunlux. The SCL Database Interface (2) basically integrates the IEC SCL into ISaGRAF so that the data acquired by the IEC protocol stack is available in ISaGRAF.</p> <p>The SCL physical layer interface handles the function of transmitting the frames created by the IEC protocol stack. It also performs all error handling and communication control at the physical layer. Finally the SCL configurator is a GUI application developed in VC++ which is used to configure the IEC protocol stack itself. Besides it provides a means for configuring the communication parameters graphically.</p> <p>The system has been tested with the Protection Relays of M/s Easun Reyrolle Ltd. These relays form as IEC 103 slaves and are either multi-dropped on a RS485 bus or are connected using a Fibre Optic HUB.</p> <p>Similarly the DNP3.0 Master and Slave Source Code Libraries from TWM also have been ported on to</p>

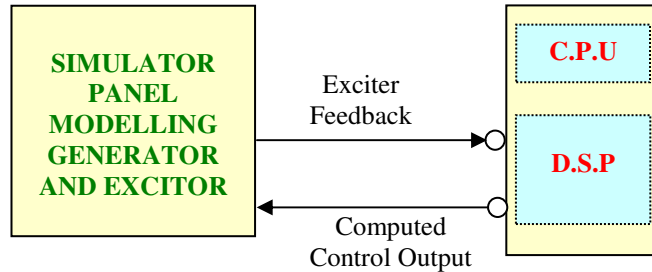
	OS9/VME and integrated into ISaGRAF.
<b>FEATURES</b>	<ul style="list-style-type: none"> <li>• Complete solution for inter connecting bay controllers with power protection devices.</li> <li>• Acquires data from multiple slaves on Fiber Optic/ RS232/ RS485</li> <li>• Supports time stamping of data</li> <li>• Adds IEC 103 and DNP 3.0 protocol support for ISaGRAF package.</li> <li>• Useful in SCADA and Substation Automation Systems comprising of power protection devices</li> <li>• Easy to use and customize</li> </ul>
<b>CUSTOMER</b>	M/s Easun Reyrolle Ltd., Hosur
<b>STATUS</b>	Commissioned



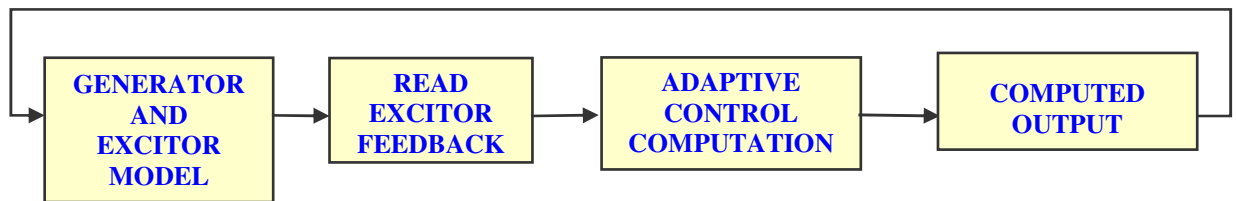


<b>PROJECT</b>	<b>ADAPTIVE CONTROL BASED ON DSP</b>
<b>SOFTWARE PLATFORM</b>	Microsoft Windows 95/NT 4.0.
<b>SOFTWARE TOOLS</b>	Microsoft Visual C++ 6.0, C++ compiler for DSP.
<b>HARDWARE PLATFORM</b>	Intel Based Pentium II, Texas TMS320C30 DSP, Signal Conditioner for Generator Exciter interface.
<b>WORK EFFORT</b>	6 Man-months on C++ for DSP Adaptive Control Algorithm 3 Man-months for MS VC++ 6.0 based GUI and real-time plot
<b>DESCRIPTION</b>	The project involves development of an Adaptive Control Algorithm for closed loop control of Exciter voltage control for Generating Machines. The algorithm runs on a TMS320C30 DSP chip with a cycle time as low as 1 ms. The DSP board fits into the EISA slot of a standard PC and has a 12 bit ADC/DAC with capability of acquiring 8k samples per second. The algorithm has been tested on a High Voltage DC simulator successfully. The algorithm itself has been developed in C and uses DMA transfer to communicate with a PC for accepting user inputs and for graphical data analysis of algorithm parameters. The analysis tool, a real-time 2D plot utility has been developed in MS VC++ 6.0 and provides all standard plot functions like auto scales, least square approximation, log scales etc.
<b>FEATURES</b>	<ul style="list-style-type: none"> <li>• Implementation of Adaptive Control Algorithm for Exciter Voltage control for Generating Machines for 1MW and above.</li> <li>• The algorithm is a substitute for conventional method of exciter control and improves control and efficiency drastically.</li> <li>• Very cost-effective solution.</li> <li>• Finds application in majority of Power Generating Plant.</li> <li>• The DSP based solution reduces components thus increases reliability and self-tuning algorithm reduces time of commissioning.</li> <li>• Is connected with PC for monitoring the optimized process.</li> <li>• The GUI built with MS VC++ 6.0 has elaborate user interface for real-time auto scaled plotting and display of parameters.</li> <li>• User friendly tuning menu for initial trials.</li> </ul>

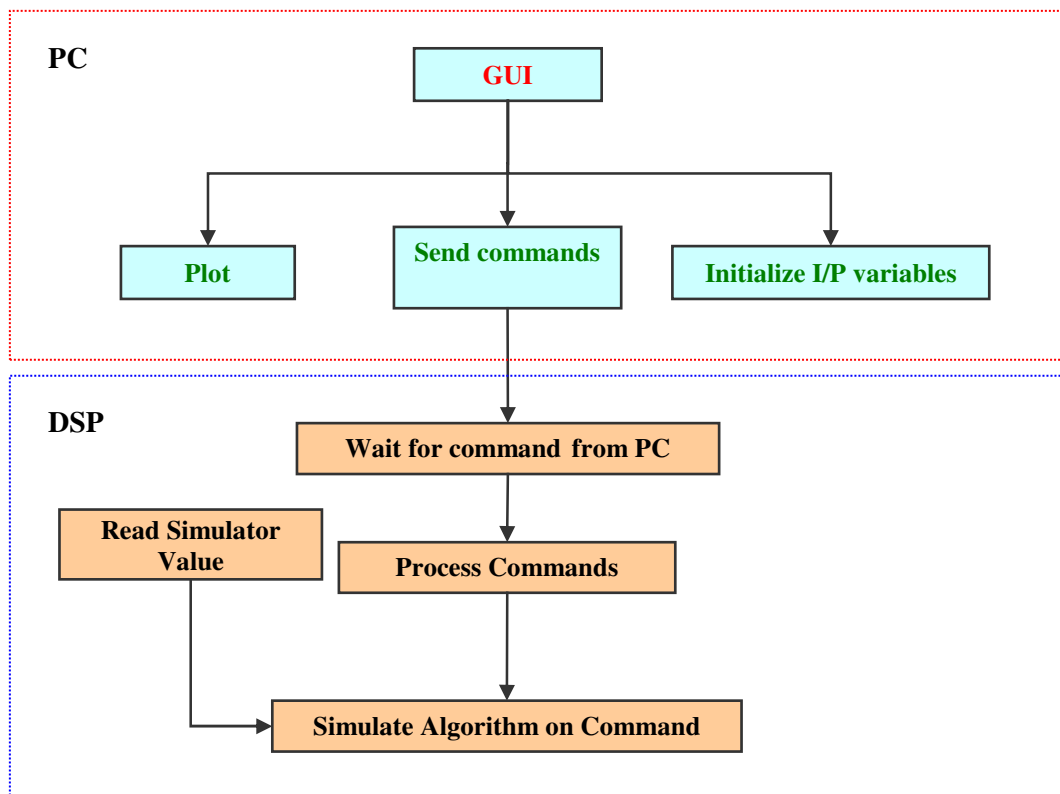
<b>CUSTOMER</b>	Central Power Research Institute (CPRI), Bangalore
<b>STATUS</b>	Commissioned



CONFIGURATION OF THE DSP BASED ADAPTIVE CONTROL



THE CLOSED LOOP CONTROL



FLOW CHART OF THE SOFTWARE

