Technology at its ecstasy

Crystal ProCon

Real-time Production Monitoring System for Apparel Manufacturers

Coded Tag and Reader Unit Based System

Designed and Developed by
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CONTENT

TRADEMARKS:

Crystal Consultancy Services Private Limited

PROFILE

Crystal Consultancy Services Private Limited (CCS) is a progressive customer oriented Information Technology solution provider in terms of software development, maintenance services, consultancy services and products across various platforms. We provide state-of-the-art products, and services to our clients, through our powerful synergy of professionals, processes and technologies.

VISION

Our Vision is to connect people and technology.

MISSION

Our Mission is to provide innovative world class information technology solutions with paramount importance to our clients' satisfaction.

TEAM

We have an enthusiastic and talented team of dedicated professionals that contributes to our overall success to keep us at the top. Our team spirit is what gives us edge over our competitors. We not only develop great software, we develop great people too, and hence we attract the best professionals in the industry.

TECHNOLOGY

Technological advances in the field of Information Technology have been overwhelming in the present years but the gap between people and technology has been widening. **CCS** has been providing solutions, which narrows down this gap, with the use of leading-edge technology and flawless technical support. We respond to the latest technological trends and needs.

Core Technologies

- Microprocessor & Micro Controller based Industrial Control System.
- Wireless Solutions.
- Image Processing Solutions.
- Interactive Voice Response System.
- Smart Card based Solutions.
- Client - Server Applications.
- Web based Applications.

METHODOLOGY

Initially, **CCS** focuses on client's specific business integration requirements. After gaining a complete understanding of their technology utilization and business objectives, **CCS** 's technology architects then search out for the most innovative, yet practical and effective solution. Working with the state of art vendors and industry leaders, **CCS** 's methodology develops and implements technology architect's design; build a business process-driven architectures that are flexible, responsive and robust.

CLIENT SERVICE

We are committed to deliver value added and cost effective products, information technology solutions and services to the diverse needs of our customers on time. Our focus on client satisfaction is one of the best in the software industry.

BUSINESS SOLUTIONS

- Embedded System Design,Development and Consulting.
- Object Oriented Design and Development.
- Information Design Services.
- Industrial Automation.
- Internet/Intranet based Systems Design and Development .
- Database Management & Back Office Support.
- Enterprise Application Integration.
- Client-Server Applications Design, Development and Implementation.
- E-Business Solutions.
- Business Process Outsourcing (BPO) Support.
- Functional Consulting / Sub Contracting / Outsourcing.

STRENGTH

Our strength is our ability and promptness in solving mission critical problems in the most efficient and economic way.

"We commit what we can do and we do what we commit."

REAL TIME SYSTEM

A Real-time system is a technology tool, which gathers and distributes information to everyone in the factory as events are happening. Real-time System is well proven technology to achieve realistic production goals, at reduced cost and increased profit and meets customer needs at on-time delivery.

IMPACT OF INSTALLING REAL TIME SYSTEM

The benefits of installing effective and efficient real time system is seen at all levels due to immediate on screen access to all informations.

Production

- Ensures production goals to be established and monitored continually.
- Increases production at controlled production costs at all levels of work force.
- Provides production scheduling against completion dates, decides priorities.
- Enables continuous and improved line balancing

Work-in-progress

- Incorporates automatic tracking of all work-in-process.
- Provides work study database.
- Work in progress stock control through complete transaction audit trial and reduced work in progress stock levels.
- On screen status of work in progress.
- Creates awareness when work is not flowing, as it must sustain the required production.

Supervision

- Gives supervisory tool, which enables movement of people from one job to another when operators are absent or unable to meet production requirements.
- Supervisors are being advised of bottlenecks, summary throughput, work-in-progress, stock information and given work-around solutions as problems occur.

Operators

- Shows operator how to earn more money by eliminating wasted time to produce few more units each hour, hence increases productive hours.
- Guides the operator to maintain a consistent pace throughout the day.
- Better implementation of work morale among the employees.
- Informs operator of their performance to date, accurate predicted pay, etc., on and up to the second basis.
- Accurate attendance of operators.

Quality inspection

- Makes each operator accountable for the units produced.
- Provides management the tools to measure and track quality problems by source and hence are isolated as soon as they are identified.
- Everyone is empowered to recognize and solve problems as and when they occur.

Management

- All informations are presented to management and supervisors by on screen enquiries, reports and graphs.
- Reduces clerical errors and paperwork.
- Reduces overhead cost by reducing administrative overhead.
- Reduced stock take costs, as accurate work in progress reduces the need for stock taking.
- Accurate cost calculations of the finished products and the related jobs.
- Management of orders and the combinations of the order incurred with reference to the work-in-progress helps in analyzing the market trends.
- Ever-ready state of the factory feasible for the site visits of the clients and prospective investors at any time enhances the market value of the factory.
- Increased order booking.

Customer Care

- Supports to become more reliable and trusted supplier, to meet the needs of customers.
- Enhances accurate delivery of orders to customers.
- Improved customer relations with accurate information on hand whenever needed.
- Better customer services resulting from all workstations.

IDENTIFICATION TECHNOLOGY

BarCodes

BarCode system requires electro-optical readers and electro-mechanical printers.It follows a symbology, which must be decoded to obtain the desired character code.

Magnetic stripes

Magnetic stripes on plastic carriers (E.g., Credit Cards) or paper ticket stock.The stripe on the back of the card is a **magnetic stripe**, often called a **magstripe**. The magstripe is made up of tiny iron-based magnetic particles in a plastic-like film.The information on the card is read by swiping it through a reader.

Smart cards

A smart card resembles a credit card in size and shape, but inside it is completely different. The inside of a smart card usually contains an **embedded 8-bit microprocessor**. The microprocessor is under a gold contact pad on one side of the card. Think of the microprocessor as *replacing* the usual magnetic stripe card.

iButton Tag

The iButton® is a computer chip enclosed in a stainless steel can. The steel button can be mounted virtually anywhere because it is rugged enough to withstand harsh environments, indoors or outdoors. It is durable enough to attach to a key fob,ring or any objects.

Features of iButton Tag

- iButton proves its identity by its globally unique serial number.
- It can hold upto 100 times the data of bar codes.
- iButton's chip data content can be changed while attached to an object. It can accommodate over one million changes.
- It can be read without expensive electro-optical equipment.
- Efficiently tracks the movement of the objects.

Highlights of iButton on other identification technology

	Description	iButton	BarCode	Magnetic Strip	Smart Card
1	Data Acquisition	Inexpensive ProCon Readers.	Expensive Electro-Optical Readers and Electro-Mechanical Printers.	Expensive Magnetic Readers.	Expensive Smart Card Readers.
2	Data Reliability	Not affected by Dirt, Magnetic / Electric Field.	Affected by Dirt and Light Intensity.	Magnetic or Electric Fields can Erase Data.	Exposed Copper forms a hard Oxide,which decreases the contacts quality and leads to card malfunction.
3	Symbology	ASCII Characters.	Standard Symbology.	Properitory Formats.	Properitory Formats.
4	Sensitivity	Needs only 2 contacts which are insensitive to angular orientation.	Poor signals occurs with changing scanning speed, varying scanning angles,poor contrast due to high ambient light.	The reader needs precise mechanics for correct alignment, smooth and continuous movement of the card.	It has 8 contacts which are sensitive to alignment and sequence in which contacts are made.
5	Operating Environment	It is made of clam-shell steel container called a micro can is better suited for harsh operating environments. Withstand mechanical stresses.	Prone to tear off.	It is on Plastic carriers are not suited for harsh operating environments. Cannot withstand mechanical stresses.	Cannot withstand mechanical stresses.

COMPARISON CHART

S.No.	Description	ProCon System	BarCode System	Magnetic Card System	Smart Card System
1	**Data availability**	Online	Offline	Online	Online
2	**Bundle Identification**	iButton Tag	BarCode stickers	Magnetic Cards	Smart Cards
3	**Operator efficiency**	Instantaneous	After scanning barcodes	Instantaneous	Instantaneous
4	**Operator production log sheet**	No	Yes	No	No
5	**Production forecast**	Instantaneous	After scanning barcodes	Instantaneous	Instantaneous
6	**Production counting**	Online	After scanning barcodes	Online	Online
7	**Work-in-progress**	Online	After scanning barcodes	Online	Online
8	**Line balancing**	Instantaneous	After scanning barcodes	Instantaneous	Instantaneous
9	**Machinery downtime reporting**	Yes	No	Yes	Yes
10	**Paperless work centre**	Yes	No	Yes	Yes
11	**Initial investment**	Comparatively less	Less	Very expensive	Very expensive
12	**Recurring cost**	Less	More	High	High
13	**Networking**	Less	N/A	Expensive	Expensive

Crystal ProCon

Crystal's **ProCon** 1.0 is a revolutionary technology for achieving real time goals in the Garment and Apparel manufacturing Process. **ProCon** is a digital assistant in the quest for maximizing enterprise productivity.

Global market and technology are forcing tremendous changes in the Textile and Apparel industries. **ProCon** system is focused on the issues, complexities and opportunities for Apparel and Textile companies and their suppliers. **ProCon** system is fully interactive and integrates with the complete range of distribution, material and capacity planning, manufacturing and financial systems which makes it the most comprehensive Apparel ERP solution.

The key objective of **ProCon** system is to collect production information on a real time basis to enable the production management team to respond instantaneously and to solve any problems that may arise within the line. **ProCon** system operates without requiring any changes or placing unreasonable demands on the way your business operates. **ProCon** system yields returns with cost savings to pay for your system, right from the first day it is installed. **ProCon** system has the capability of making almost every apparel manufacturer more competitive and better supplier.

Crystal ProCon System is proven to deliver dollars to your bottom line

Salient Features of Crystal ProCon :

- Secured Logon.
- Fault tolerant system.
- Maintains history of bundles, operations processed by the operator.
- Works in dual mode i.e online and offline.
- Reader units are hot swappable.
- Supports progressive bundle movement / Piece-by-piece movement.
- operator Idle Time Accounting.
- Job / Operator Rework Accounting.
- Reader Unit has back up memory which can store the punches.
- **ProCon** Interface Software controls individual **ProCon** Reader.
- Centralized on-line production status and monitoring Tool.
- Gathers real-time information on the efficiencies of machines, operators and processes.
- Providing data to communicate or interface with other application systems.
- Generates instant and dynamic Reports & graphs at all levels.

- o 100% data reliability and sequential data integrity even after network failures, server or database failures.
- o State-of-the-art networking technology provides any instant operating status and finished product count of each machine in your plant.
- o Reveals line and machine utilization, throughput cycle time, starved and blocked conditions, faults and alarms to take corrective action.
- o Generating Alerts for exceptional situations, which can be configured and customized in order to notify 'exceptions' to key people via e-mail or SMS.
- o Proactively detects and reacts to problems before they escalate.
- o Improved In-line quality checks and controls.
- o Certain features of **ProCon** can be configured as per customer requirement.

Pre-requisite hardware and software for installing ProCon

Hardware

Server	-	Pentium Core2 Duo, 4 GB RAM, 160 GB HDD, Network Card, CD-ROM, Color Monitor, Keyboard, Mouse.
Controller PC	-	Pentium Core2 Duo or higher, 2 GB RAM, 160 GB HDD, 17 Inch LCD Monitor, Network Card, 2 Serial Ports, CD-ROM, Keyboard, Mouse.

Controller Computer

All Reader units are connected to Controller computer through Network. Controller computer is connected to the Database Server.

The Interface software installed in this Controller PC collects the data from the reader units and stores in the database server.One Controller PC can handle upto 256 Readers connected to it.

Software

Server Operating System	–	Windows 2003 advanced Server with SP4.
Clients Operating System	–	Windows 2000 or higher.
Database	–	Microsoft SQL Server 7.0 or higher.

Hardware components of ProCon

1. Reader Units
2. Quality Control Unit
3. iButton Tags
4. Networking accessories

READER UNIT

Reader Unit Fixed to every sewing machine in line and networked with CAT5 cable & connected to Controller PC. It captures Tag ID, Workstation ID, Date and Time.

iButton probe

The iButton Probe receives the data when tag is punched on it and transmits it to the Controller PC.

The Operator can view Target Qty, Actual Qty, Efficiency, Earnings on the tag reader screen by pressing respective buttons.

Reader Unit Configuration

- 2 x 16 Liquid Crystal Display
- iButton Contact Probe
- 64 K EEPROM (expandable)
- Info Button
- Navigation Buttons
- Function Button
- Switch Mode Power Supply
- Real Time Clock
- RJ45 Interface

CODED TAG

Pre-coded Tag for bundle identification

A coded Tag is physically attached to every individual bundle and sent to sewing line for production. This Tag travels along with the bundle in the sewing line from start to end. As each operator starts his/her bundle he/she will tag onto his/her reader unit,which will denotes the start of the bundle.On completion of the bundle the operator will again tag onto the reader to indicate the end of the bundle.

Pre-coded Tag for employee identification

A coded Tag is provided to every employee for his or her identification purpose. Employee uses this tag to login at the workstation before starting work and logout while leaving the workstation.

There are two types of Coded Tag.
Static tags will have a preset value, which cannot be changed.
Dynamic tags are programmable and that the values can be set or reset by the user.

QUALITY CONTROL UNIT

A QC Reader is attached to every checker table in the sewing line.

The checker inspects the bundle and records the status of the bundle viz, Rework/Rejection/QC Passed pieces with appropriate defect codes.

* In case of Rework the bundle goes back to the concerned operator
* In case of Rejection entered pieces are removed from the bundle.
* All reports pertaining to QC are generated by the system.

QC Unit Configuration

- 2 x 16 Liquid Crystal Display
- iButton Contact Probe
- 4X4 Matrix Keypad
- 64 K EEPROM (expandable)
- Toggle Button (Actual / Target / Incentive / Efficiency)
- Switch Mode Power Supply
- Real Time Clock
- RJ45 Interface

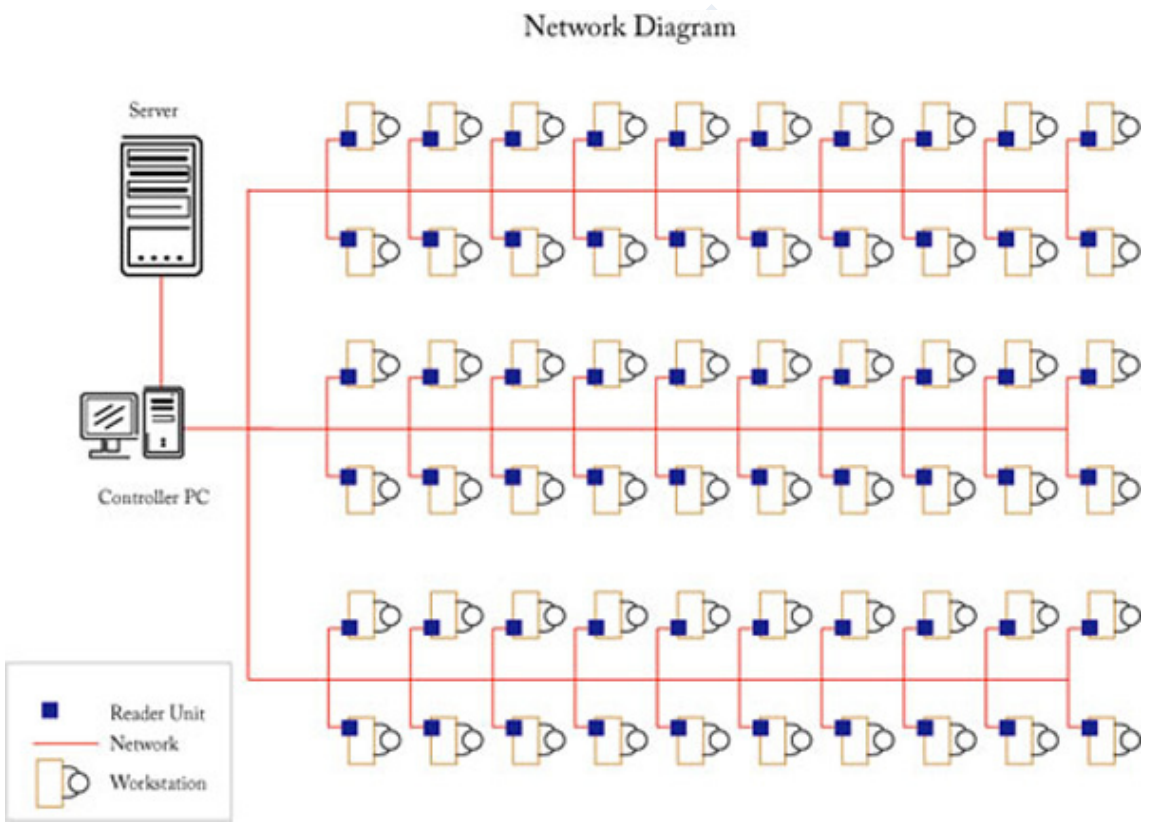
NETWORKING

- o CAT5 Cable.
- o Full Duplex Multi-drop Networking.
- o RS485 Protocol.
- o RS485 to RS232 converter.
- o Network Hubs.

All Reader Units are connected to the Controller PC through Multi-drop Network and the Controller PC is connected to the Database Server.

NETWORKING DIAGRAM

ProCon Readers Connected in Sewing Lines



Bottleneck Display Board

The display board displays

o Daily target, actual output and efficiency of the sewing line or section

o User defined bottlenecks viz. Machine Breakdown, Operator idle Time, Alteration Time, Work-In-Progress, Efficiencies are identified and displayed with the workstation numbers by a different color LED bulb as and when they occur.

o User can prioritize bottleneck conditions that are displayed on the board.

Bottleneck Display Board

Software for ProCon

1. Data Acquisition Software
2. Production Management System (PMS) Application Software

Data Acquisition Software

This software is installed on the Controller PC, which captures and validates real time data (punch) from all the reader units and stores it in a database server.

Production Management System (PMS) Application Software

PMS is full-featured Application Software. PMS has the following modules:

1. Masters
2. Transactions
3. Reports

Masters

1.	Buyer Master	-	Details of buyers
2.	Destination	-	Details of destination
3.	Reader Unit	-	List of Reader Units installed in the factory
4.	Tag	-	List of pre-coded Tag details used in the factory
5.	Employee	-	Details of employees with their respective Codes and Tag Ids
6.	Production line	-	Details of production lines in the factory
7.	Operations	-	List of operations that are used
8.	Group	-	Details of groups that are used to define set of operations
9.	Style	-	Details of style viz. style code, colors, sizes, order quantity, destination, ex-factory dates
10.	Item	-	Details of fabrics used for styles
11.	Size	-	Details of sizes used in styles
12.	Color	-	Details of colors used in styles
13.	Sequence / WIP settings	-	Defining and setting the sequence of the operations for a style and groups
14.	Resource assignments	-	Assigning and mapping of available resources (man and machine) to the operations defined for a style
15.	Category	-	Details of Employee types (eg.Sewing/Maintenance)
16.	Country	-	Details of Countries
17.	Machine	-	Details of Machines
18.	Shift	-	Details of Shift & Timings
19.	DownTime	-	Details of various downtime reasons

20. Possible resource assignments are :

1 Operation	– 1 machine
1 Operation	– N machines
N Operations	– 1 machines
N Operations	– M machines

Transactions

1.	Order details	- Detail of orders for styles with color size breakup and cut quantities is entered.
2.	Fabric requirements	- Details of fabrics required, consumption and cut quantity is entered.
3.	Lay Register	- Details of lay for a cut is entered.
4.	Cutting details	- Details of cutting is entered
5.	Sorting details	- Details of sorting is entered
6.	Bundling details	- Based on the cut details, bundles are generated with the respective ply nos. and bundle pcs.
7.	Bundle-to-Tag Mapping	- Based on the bundle size given, bundles are generated with unique bundle number for every bundle. Tag Ids are mapped and assigned to the generated bundles. Then Tag Ids are physically tied to the bundles and sent for sewing.

Reports

1.	Production report	Operation wise,Operator wise Session wise,Line wise
2.	Performance / Efficiency Report	Operation wise,Operator wise Session wise,Line wise
3.	Work-in-progress	Operation wise,Group wise
4.	Production comparison	Operation wise,Operator wise Session wise,Line wise
5.	Production forecast report	Style wise / Line wise
6.	Down time report	Line wise
7.	Variance report (target vs. actuals)	Operation wise,Operator wise Session wise,Line wise,Style wise
8.	Quality check report	Operation wise,Operator wise Session wise,Bundle wise

PROCESS OVERVIEW

Laying

Laying the fabric on the Lay Table as per Cutting Requirements.

Cutting

Cutting the Laid Fabric according to the pattern

Bundling

The System Generates series of Unique ply numbers for every layer of fabric laid. The System Generates a unique bundle number for every bundle based on the bundle size specified.

Sorting

The Bundles are sorted and grouped to have respective parts based on the Group/ Operation and operation sequence

Assigning Tags to Employees / Operators

For Employees' identification purpose, each employee is assigned and given an iButton tag. Which they use to login and logout at their assigned workstations prior to start and leave

Assigning Tags to Bundles

An ibutton tag is mapped and assigned to every bundle with their respective bundle numbers. Then the same tag is physically tied with the bundle and sent to sewing line. Every bundle carries one tag.

Resource assignments

Assigning and mapping of available resources (man and machine) to the operations defined for a style.

Operation – Operator - Machine

Possible combinations of resource assignments are:

1 Operation – 1 machine
1 Operation – N machines
N Operations – 1 machines
N Operations – M machines

Issue to Sewing

The bundles along with the iButton tag are issued to sewing line for production.

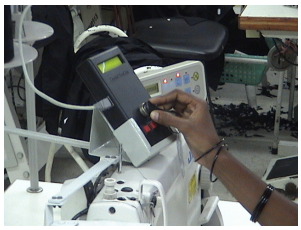
Sewing

Every piece of garment goes through different operations in production line. A bundle may have N pieces of garments of same style where the individual pieces undergo the same process repeatedly till the bundle is finished.

Each operator will do the designated operation in the sequence.

o **Start Punch**

On receiving the bundle, the operator will punch the tag, which is tied with the bundle, on the iButton Probe of the reader unit to indicate the start of the operation



o **End Punch**

On completion of the bundle, the operator will once again punch the tag on the iButton Probe of the reader unit to indicate the end of the operation.

The time difference between the start and end punch is calculated as the production time for a particular bundle.

When a tag is punched, the reader unit captures the following data:

- Workstation ID
- Tag ID
- Date and Time

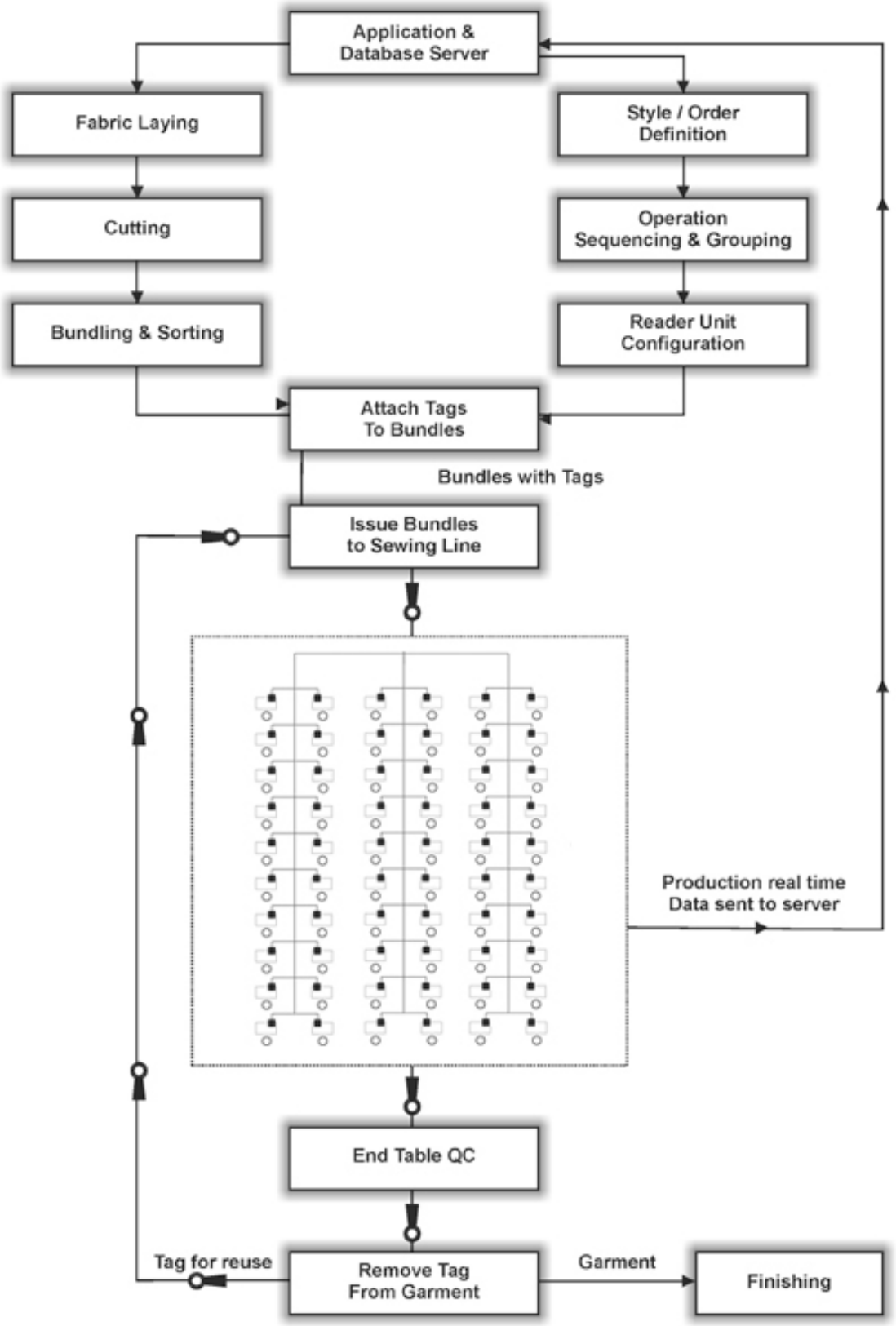
Punches Captured in the reader units are sent to the central database server over a network. This is continued till the last operation in the sewing line. After completion of the final operation, the tag is removed from the bundle / finished garment and sent back to re-use.

The software calculates production qty and production time for every bundle.

Production Time - Difference between the start time and end time
Production Qty - After an end punch is received, the software takes the Bundle pieces as production qty.

The system will provide real time production status on a Bundle / Operation / Operator basis.

FLOW DIAGRAM OF OPERATION



Key benefits of ProCon

ProCon System provides efficient and effective real time information for the performance of the company to implement business strategy successfully.

- **Instant Reports at all levels.**
  ProCon system reveals real time information and reports at all levels.

- **On-Line Production Status**
  ProCon system provides on screen access to production order and their progress, to eye production status.

- **Improvements in effective and efficient usage of man & machine.**

- **Efficient Line Balancing**
  ProCon system furnishes accurate information of line balancing
  1. Details of employees present and absent on the day
  2. Information on current production in progress against target set.
  3. Status of work-in-progress with reference to operational level currently and in-relation to achieving target in fixed time.
  4. Line balancing in workflow

- **Reduction of Work In Progress Time**
  ProCon system makes production tracking more transparent and this removes the need for checking the work-in-progress every two hours.Workforce analysis on who is working under each section of workflow and the cost of their performance against the project can be monitored whenever needed.

- **Reduction in Downtime**
  ProCon system reduces unproductive downtime by 20% by providing downtime reports which will enable management to initiate corrective action.

- **Improved In-Line Quality Control**
  ProCon system provides better quality control measures by tracing the garments that do not pass the quality control standards faster. Hence it reduces the 5% of downtime costs associated due to faulty goods.

- **Eliminating the need for Supervisory Checks**

- **Accurate time keeping**
  ProCon system ensures that the operators check-in directly in time at their workstation. This ensures considerable reduction in queuing time per operator.

- **Accurate Payment to Operators**
  ProCon system prevents unnecessary waste of labor time in maintaining their own records and resolves disputes among operators in calculating the cost of the work done by each employee. The operators are paid only for perfectly completed work and appropriate reductions are applied for faulty pieces before payment. **ProCon** system eliminates holding back of work tickets and paying twice for the same work. Errors in payroll claims are also reduced to great extent. **ProCon** system calculates the gross payroll faster than the traditional book keeping system.

- **Reduction in Overtime Working with maximum utilization of HR**
  Absence of key workers adds on to the overhead charges and affects the productivity. **ProCon** system highlights the problem immediately and eliminates unnecessary overtime. An efficiently implemented real time system would reduce the overtime expenses by 50%. Future production planning is made easier.

- **Reduced Administration Costs**
  ProCon system reduces paperwork and clerical errors.

- **Accurate MIS Reports**

- **ROI In Less than 2 Years**
  By installing **ProCon** system, you will reap return of investment within two years. You can also benefit from the ProCon hardware depreciation over a period of time.