1. Introduction of iCube Paper Converting System™

iCube Paper Converting Management System is a customized version of iCube Process Manufacturing System that converts raw papers to paper products through the processes of slitting, printing, converting for labels, fan-fold and perforation; rewinding, wrapping and packing. It also works for the film and foil conversion in addition to paper.

Flexible and configurable to fit process requirements
It allows you to define manufacturing workflows for various product and production requirements. Each workflow consists of user definable manufacturing processes to be operated in a configurable sequence. Each process is configurable to tie to a specific labor force and machineries for easier production planning, scheduling, executing and control.

Accurate inventory tracking, yield and cost
Paper converting requires both "process" and "discrete" manufacturing processing. The material usage, transformation and formula are defined by process and in the bill-of-material of the product. For each process, the time, material and quantity are tracked "In" and "out" and the system computes the material usage, yield and cost. It also derives the indirect labor and overhead defined in the setup.

Precise production history, status, progress and issues
While operating a process, on top of the work order header, authorized users see the current status and the history of transactions, progress, issues and notes with time and user stamp for all previous process. The system prompts for updates of the quantity of the output materials, the updated notes, issues and the required fields.

iCube PCMS consists of the following modules and integrates with Sage Accpac ERP or can be run standalone.

a. **Manufacturing Quote "MQ"**
   "MQ" facilitates the quoting process for existing and new products up to three lot sizes. It allows users to project the selling price based on the costs of setup, material and labor for all processes and overhead. User can define different profit margin and freight charge for different lots to come up with the selling price.

   Quotes for new items (product or material/components) require definition of the new items and bill-of-material. "MQ" auto creates the information to ERP and only when the quote is accepted to eliminate the unused entries in ERP if the quotes are not materialized.

   The actual versus quote feature allows you to measure the quote performance in terms of the accuracy in cost and delivery schedule.

b. **Bill of Material "BOM"**
   The standard bill-of-material is for discrete manufacturing that defines the components and quantity used to build the finished goods. "BOM" also includes

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- the manufacturing workflow broken down by processes and ties the component usages to each process.
- the optional fields defined in ERP for the finished product and the primary material
- the capability to store documents to link to this BOM in the format of PDF, text, image, audio and video.

c. Production control "PC"

"PC" does the overall production planning for all approved work orders. It has the built-in centralized calendar to track schedule by machine or production line (labor).

The intuitive tree-view of work orders lists all pending work orders by processes that users can easily schedule a work order process by simply dragging the process to an available time slot for a particular machine or production line. "PC" will validate all schedules are in the processing sequence for the required workflow. Rescheduling of pending processes is simply moving it from one time slot to another. Users can easily view the planned schedule by machine/production line or by work orders.

d. Work order "WO"

"WO" manages a manufacturing work order from creation, approval, receiving materials/components to WIP to completing the manufacturing workflow of building the finished product.

During the manufacturing processes, authorized users can receive shortage items or issue them to designated warehouse (surplus or defects). It does cost roll up of the finished products by summing up all materials and labor cost for all processes.

2. General features

iCube PCMS is a specialized version of iCube process manufacturing system for converting paper products for printing, labels, fan-fold and perforation. It consists of the following modules and integrates with Sage Accpac ERP or can be run standalone.

a. Full functionality from quote to plan to execution
b. User configurable workflow with generic and specified manufacturing processes
c. Tracks the in and out for each process of materials, components and the labor and time spent for each process.
d. Centralized calendar for planning and assigning manufacturing process
e.

a. Workflow for creating quotes, BOMs and WOs

These documents and orders are processed with the following processes

a. Create
    i. To define a new quotes, BOMs or WOs.

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ii. Once created, they are ready for review and approval.

b. Edit
   i. To make changes for quotes, BOMs or WOs
   ii. They can be revised to reflect with most required changes before they are being approved for additional processing.

c. Approve
   i. To approve and authorize to process quotes, BOMs or WOs.
   ii. Only the approved one will be routed for further processing. Rejected one can be allowed to make changes to resubmit for approval

d. Process
   i. For quote, there is an additional "Accept" process for customer acceptance that will create a sales order, and new items, new BOMs for the missing items in the quote.

   ii. For BOM, there is no more process after approval

   iii. For WO, there is a "Produce" process to build the products defined in WO.

b. ERP integration

iCube ProcessMfg integrates to Sage Accpac ERP 5.6 with the modules AR, SO and IC. The integration to the IC module also includes the optional fields which define the additional parameters for the items such as paper length, core size, weight per square meter, index mark position, wrapping material etc.

Note the optional fields are to cover all item classes (products, paper materials and components). Since any item only belongs to one item class, only the parameters related to that item class would be meaningful. All other optional fields that belong to other item classes should be left blank for that item.

c. Process attributes

Manufacturing processes for paper manufacturing are specialized. There are processes that perform specific functions, using specific machinery, consuming materials and components based on a specific formula. To fulfill the processes requirements, iCube ProcessMfg has built the following processes identified by the unique process attributes.

a. Web Converting for printing, label converting, fanfold and perforation

   It consumes raw paper and paper cores and produces the paper rolls through the processes of printing, label converting and fanfold and perforation.

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b. Slitting

This process is to slit the original or fabricated paper in rolls or sheets to smaller form factor.

c. Wrapping

This process consumes the wrapping material to wrap paper rolls.

d. Packing

This process consumes the packaging materials (that may consist of inner packing, mid packing and master packing) to pack the paper products.

e. Labor only

This process conducts labor or machine times only without going through any material transformation.

d. Manufacturing workflow

ProcessMfg is workflow oriented. Workflow is a sequence of manufacturing processes predefined in a route. All products to be manufactured with a workflow would be routed in the fixed sequence of manufacturing processing flow defined in the workflow.

Different products may require different manufacturing workflow to produce. Sometimes, the same product may be manufactured with different workflow.

Example: You define the workflow “web converting and rewinding” that consists of sub-processes of “printing”, “Label converting” and “Fan-fold & perforation”. It produces a product from raw material stage.

If you already have paper rolls already in stock, then, you may only need a workflow, say “wrap and pack” to just wrap and pack the paper rolls.

So, for the given paper product, it may requires the above two workflow depends on the inventory and manufacturing requirement.

e. Auto creating of item no. and BOM from “MQ”

New items, the related item optional fields, and new BOMs can also be created by the “MQ” module. During the MQ entry, all the new items and parameters entered in MQ, and the BOM structure of products will be automatically created to the Accpac IC module, when the quote is accepted.

Please refer to the “MQ” module” for detail.

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f. Tracking of raw paper rolls

All raw paper rolls with the same item no. starts with the same initial length after purchase. When a roll is used in production, the length of the paper roll will be decreased. We need a unique ID to define each unit of paper roll such that we know which roll has been used for prior production and with what length remained.

It requires the serial number tracking feature which is only available with Accpac "Serialized inventory Module". On top, we also need a "Manufacturing PO" module to assign the serial no. of each roll during PO receipts and assigns to the WO module to produce. To save cost to do the serial no. and manufacturing PO receiving, a utility of "Get Paper Info" is built to perform the above requirements.

g. Cost tracking

Cost of producing products include the following elements

a. Paper Material
   Usage for paper is driven from provided formula

b. Components
   Includes paper core, wrapping material and packaging materials

c. Labor
   Sum of labor for all processes

d. Overhead
   Limited to indirect labor cost

Cost estimation is defined in quotes. Actual cost usage is logged in WO. The estimated cost in quotes and actual production cost in WOs are available for benchmarking.

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2. Manufacturing quote “MQ”

“MQ” is to quote for manufacturing a product up to three different lot sizes. Unlike the regular sales quotes that mainly provide the standard off the shelf product, manufacturing quotes need to provide the requirements, details and instructions in the production processes and materials and components.

Many quotes are for new products with new materials and components that these new items have not been defined in Accpac. To avoid users to create the missing items and BOMs in Accpac at the time of quote, the system allows users only to enter the minimum required info including the item number; the account code and item category and the new items and related BOM will be created when the quote is accepted. This feature saves users’ time and effort to create the missing items and BOM in Accpac before they can do the quote. It also reduces the amount of unused items if the quotes are not accepted.

NOTE: The remaining item information will still need to be amended in Accpac. This feature only shorten the lead time for doing the quotes but do not mean to skip the required field definition of the new items.

a. Organization of data fields

Entering a quote requires information for the customer, product and lot size and required dates, the workflow and process related parameters, manufacturing instructions and remarks, materials and components, labor and overhead, setup charges, profit margin and shipping method.

MQ auto creates the following tags to group the related info for easy access.

a. Header
   Customer info, product to order, lot size, required date, shipping method, comment and instruction

b. Tag “product”
   Item no. for existing item, product parameters

c. Tag “Material”
   Item no. for existing item, material parameters

d. Tag “Process 1” to “Process n”
   Process related parameters. A process may also have sub-processes that the required parameters for process are organized in the tag.
   Each process also has fields to define the estimated labor charges.

e. Tag “Setup”
   To define the setup charge items which are provided as an option for the quote.

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f. Tag “Overhead”
To define the indirect labor charge

g. Tag “Summary”
To list the cost elements from all other tags for easy view, and to allow you to enter freight charge and profit margin. Once profit margin is entered, it will list out the profit and selling price.

b. Process “Enter MQ”

This process allows users to define the requirement of quotes by entering the data in the quote header and the following tags. You need to click save on each tag after you have entered the info in that tag.

a. Product info:
b. Paper material info:
c. Process info:
d. Setup info:

1. Click “New” in the command bar
The MQ entry screen is updated with the next Quote no.

2. Enter the info in the quote header including customer, the product to build, the lot size and required date

   If the product is new, need to go to the product tag to enter the product parameters. The new item no. for product is not required at this stage.

3. Enter the paper material to build the product
   If the material is an existing item, select the paper material item no. and all info for this paper is displayed.

   If it is a new paper, define the paper parameters. The new item no. for material is not required at this stage.

   Enter the estimated usage, and the wastage percentage, and click save.

4. Enter the process related info

   The system will display the process of the workflow to produce the product. For each tag, enter the info to define the process requirement and estimated labor charge; and click “Save”.

5. Enter the indirect labor info in the overhead tag and click “Save”.

6. Enter the setup charge (as independent item, not in quote) in the setup tag and click “Save”.

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7. All the cost elements will be reflecting in the summary tag. Also, enter the freight charge and the profit margin. The summary will be updated with the quoted unit cost per lot size, followed by clicking “save”.

8. Click “save” again for the entire quote. The Quote is now ready for approval.

c. Process “Edit MQ”

This process allows users to change the content of the quote before it was approved by manager.

1. Select the quote no. from the tree view.
   The content of the quote is displayed.

2. Make the appropriate change

3. Click “save” button to save the change

d. Process “Approve MQ”

This process allows authorized users to do internal approve of the quote within the company. Approved quotes are official and are ready to be sent to customers for acceptance.

Select the quote no. from the tree view, the content of the quote is displayed.

Click the approval button to approve this quote and the quote is now ready to submit for customer for review and approval.

The quote is now ready for customer acceptance.

e. Process “Accept MQ”

This process is to reflect the status of customer acceptance. Customers’ accepted quotes will be mark in the system that the quote is accepted allow users to define the requirement of quotes by entering the data in the quote

1. Select the quote no. from the tree view.
   The content of the quote is displayed.

2. Click the “accept” button to accept this quote

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3. Bill of material module

Bill-of-material is a manufacturing recipe to define what components and the required quantity to build what finished goods with what quantity. The manufacturing model for products with components from BOM with “fixed components and quantity” is called “discrete manufacturing”.

Manufacturing of paper products, on the other hand, consists of materials in which the usage of the material are not fixed in quantity and is based on a formula, and is depending on the parameters of the material and the manufacturing processes. Examples are the paper material, the ink for printing etc. This type of manufacturing model is called “process manufacturing”.

Paper products also consist of fixed components with fixed usages that are defined in the BOM, such as paper core and packaging materials.

a. Enhancement to support “Process Manufacturing”

The BOM module is modified from the discrete manufacturing model to include the following data

1. Manufacturing workflow with relate processes to produce the product
2. The list of component and usage quantity, and at what process to be consumed
3. Paper material with consumption based on formula embedded in work order and quotation.
4. Listing of parameters for product, materials and components described in Accpac item optional field
5. The printing design no. and label converting design no.
6. List of manufacturing documents in format of PDF, Text, Audio, Video, Image that users attached to the BOM

b. Workflow of BOM creation

As described in paragraph 1.1, the process of generating a BOM is through the sequence of processes of BOM creation, revision to approval. Only the approved BOM will be available for production use.

c. Auto creation from “MQ”

As described in paragraph 1.5, a BOM can be auto created from the MQ module with the information entered in a manufacturing quote.

The BOM created from quote is automatically approved and is ready for production.

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4. Production control Module

The production control module manages the master scheduling of work orders by manufacturing process.

A product is manufactured based on the required workflow that consists of a fixed routing of manufacturing processes. Each process requires resources (material, machinery and labor) to produce.

Production control gives you an overview of

a. what approved WOs are going to be produced and the related processes displayed in tree-view
b. what processes of what work orders have been scheduled,
c. what processes of what work orders are not yet scheduled,
d. what are the empty time slots available for the pending process

The pending processes to schedule is displayed in tree view. The planned processes and empty slots are organized in a centralized production calendar that you can view by process and machine.

With this tool, you can simply drag and drop the pending process to an empty time slot and the process you placed in the calendar was just scheduled.

You may reschedule the existing planned processes by moving them around in the calendar to make time slots for a given process.

There is daily production schedule report available to display what are the planned processes of what work orders. Then, we can base on this daily production schedule to produce the work orders.

This module interacts tightly with WO module. Only approved WOs will be available for scheduling. The allocated time for processes of work orders will be updated to the WO for the estimated start time.

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5. Work Order Module

WO tracks the processes to manufacture finished goods from start to end. The finished goods to be produced need to include

- a default manufacture workflow to define the manufacturing processes
- BOM to define the material and component requirement
- related optional fields to define parameters for product, material, component & process.

For BOM, in additional to defining the components with the fixed usage quantities like the paper core, packaging material etc., it is enhanced to include the paper material in which the usage is not definable by a fixed quantity and is based on a formula.

a. Build to order and Build-to-stock

A WO may be created to fulfill one particular sales order “Build-to-order” or to build up inventory to fulfill backlogs and/or reserving for future orders “Build-to-stock”.

Build-to-order has the requirements of (to what customer, what to build, quantity, due date, and any specific or custom configuration and instructions) already defined in sales order. This information will be populated to the work order without re-entry.

For build-to-stock, this information needs to be decided ahead of time (normally from material planning), and to be entered during the creation of work order.

b. Cost roll up

WO tracks components’ cost based on components usage defined the Bill-of-material to roll up the cost of finished goods (abbreviated by “FG”). The unit cost of FG is the sum of the following cost elements divided by the quantity of FG produced.

1. Material cost

    a. The paper material defined in the “material” tag of the BOM
    b. The components defined in the “component tag” of the BOM
        i. Examples are paper core, wrapping material, packaging materials etc.

2. Direct labor cost

    It is the number of labor hour * hourly rate for all processes *

3. Manufacture Overhead

    Per requirement, the overhead only tracks the indirect labor cost which is the sum of all direct labor time multiple by a user-entered indirect labor rate.

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c. Tracking of paper rolls

One major task of WO is the tracking of paper rolls including

a. the usage and cost of paper used in a WO
b. the remaining length and the updated cost after completing a WO.

The unit cost of paper rolls are originated with the purchased cost when they were received in stock with full length. The cost of a paper roll decreases as the paper length decreases. If a paper roll is used to produce products, the paper length will be consumed and the remaining length will be shrunk and so is the paper cost.

In order to track which roll has what remaining length, we need to have a unique ID to track them. This serialized feature is available in the serialized inventory module which is not purchased in Nakagawa Accpac system.

Another issue is the standard Accpac PO module is not geared for manufacturing. When we do PO receiving function, it does not assign unique ID and make it available in the manufacturing system.

To solve these issues and to save cost of acquiring the serialized inventory module and customizing the Accpac PO module, the WO module has a utility to assign a unique ID to each received item in Accpac and make them available in WO module.

WO requires the width and length of Jumbo roll items to track its paper usage to produce the finished products. Users need to enter these parameters in the optional fields of the raw materials in order for the WO module to get the exact data for cost calculation.

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d. Process “Enter WO”

This process defines the following data organized by tags.

a. Order header
Customer, the associated SO number if applicable, workflow, Product to produce, lot size, order date, required date, remarks

b. Product item no. and the required process data

c. Paper material item no.

d. Component item no

e. Process info

1. Click “New” in the command menu,
2. For build-to-order,
   a. Select the sales order no., the related data from the sales order will be populated.
   b. Enter any special instruction in the “instruction field”
3. For build-to-order, select the finished good item no.
   a. Enter the quantity to build and the required date
   b. Enter the location for finished goods, component and WIP
   c. Enter any special instruction in the “instruction field”
   d. Select the material item no.,
      The parameters for the material item will be displayed
   e. Select the paper core item no.
      The parameters for the material item will be displayed
   f. Select the wrapping item no.
      The parameters for the material item will be displayed
   g. Select the packaging item no.
      The parameters for the material item will be displayed

      NOTE:
      The info is organized in tags.
      Many parameters are defined in BOM, item and optional fields. If you want to change certain parameters, you need to change in the item setting or BOM and is not allowed to change in WO
4. Click “Save”.

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e. Process “Edit WO”

This process allows you to edit a WO

In the command menu,

1. Click “edit”
2. Select a WO
3. Make changes that is defined in the Process “New”
4. Click “Save”

f. Process “Approve WO”

This process allows you to approve or reject a WO. Only approved WOs can be routed for production. Approved WOs are available for production scheduling defined in Production Control module.

In the command menu,

1. Click “Approve”
2. Select a WO to approve
3. Click the “Approve” button
4. Click “Save”

g. Process “Produce WO”

This process defines the actual info used during the production, such as the usage of material, components and labor, any process parameters, and notes.

In the material tag, enter the actual paper usage and the wastage percentage. The actual material cost and wastage will be used for

In each of the process tag, enter the usage of component with the item no. and quantity; and the Labor with the no. of labor and duration

Components include paper core, wrapping material and packaging materials

In the command menu,

1. Click “Produce”
2. In the product tag, enter the quantity produced and click save.

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3. In the material tag,

   a. Select the paper roll no.
      The current length and percentage of length left is displayed

   b. Enter the number of products to be produced from the width of paper

   c. Enter the paper usage
      The usage includes the actual length used based on formula and the wastage

      The actual usage and wastage length are calculated

   d. Click save

4. In the paper core tag, enter the total quantity of core used

5. In each of the process tag
   a. Update the quantity of the component used

   b. Enter the actual labor usage

6. When we are done with entering the data, click on “Complete WO” which will deduct all the related components and quantity and produce the quantity of FG.

7. Click “save”

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