D i g i t a l R e s o u r c e s , I n c .

Hollow Metal Configuration And Engineering Automation System

Cost Benefit Analysis

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Digital Resources, Inc.

Hollow Metal Configuration And Engineering Automation System

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Overview

Digital Resources, Inc. manufactures a system that automates the configuration and engineering of mass customized products. DRI has integrated and configured a set of the modules included in this system to address the hollow metal industry. This report presents some of the considerations relevant to an accurate cost benefit analysis of the hollow metal package. The modules included in this review handle order entry, submittal document generation, shop documentation generation, generation of programs for numerically controlled equipment, complete BOM generation and more. The complete specification for this package is available. Other modules are available

The system covers a vital, complex and wide ranging area of our customers' business operations. As a result, there are many factors that influence this analysis, and these factors will weigh differently for different customers. This document will present some of the major factors and offer examples for some typical scenarios. A complete analysis done for a specific business will require a review of its detailed operations. Please contact us for assistance in this effort.

While the details of the analysis will differ for each customer, the ROI is typically substantial because the system automates a broad range of complex and expensive tasks, and because DRI has priced this package aggressively and offers terms designed to help customers realize a positive return quickly, In addition to the direct bottom line benefits, the package delivers auxiliary benefits that are extremely important. We will review some of these as well.

The development of a system capable of delivering the functionality that the DRI system offers has been attempted by many organizations over a span of more three decades. We believe that there are a number of reasons as to why DRI has far surpassed even the best of these earlier efforts:

- A continued, persistent development of the technologies dating from the mid 1970s.
- Combining in one organization the skills and knowledge sets for the entire project, including significant expertise in computer systems design, numerically controlled fabrication, hollow metal products (including commercial, acoustic and detention variations), hollow metal manufacturing operations, business systems (including advanced implementations of MRP/ERP), etc.
- Extensive exposure to the requirements and methodologies of many different customers and suppliers to the industry.

Benefits that are clearly quantifiable

Reduced Labor and material Costs

Front Office

Elimination of duplicate data entry

The DRI system eliminates all instances of duplicate data entry, an insidious source of wasted manpower, contradictory documentation, and introduction of errors. In addition, the system has numerous features designed to speed the data entry process and eliminate many common errors.

Elimination of look-up of reference information

The wasteful walk to the templates books and other reference sources, and copying of what is looked-up there is eliminated. These documents are stored in the system and automatically recalled and formatted as required for different documentation sets.

Elimination of numerical control programming

Programming of Turrets, Laser and plasma cutters, routers, water jet cutters, forming equipment, right angle shears and related sheet metal fabrication equipment is completely automatic. Once the system is fully installed and released what was once an error prone, time intensive bottleneck becomes a reliable, automatic process.

The automatic programming is comprehensive, handling advanced issues such as custom tooling, repositioning, slug avoidance, parting techniques and more.

Since the process is entirely automatic, customers may choose to run a wider range of products through the numerically controlled equipment, and perhaps use more advanced mitering techniques and approaches to nesting work together that might have been avoided due to reluctance of overwhelming the programmers. These options can increase product quality and greatly enhance manufacturing efficiency.

Elimination of document preparation for shop

Shop travelers and detail sheets are created automatically for doors and frames. The system creates additional reports that help all aspects of the organization. Bills of materials, shipping lists, Fire Label utilization and similar reports assist administration. Shear, N/C, and forming reports facilitate more efficient manufacturing in the shop.

These additional reports are a tremendous benefit of the system that requires no additional work beyond standard order entry.

Elimination of submittal document preparation

All submittal documentation including details and associated exhibits such a catalog sheets are generated automatically.

Support for tracking Project Status

Monitoring status is a resource consuming process at every stage of hollow metal. Whether tracking that additional information is required (a missing jamb depth, a contradiction in a hardware set, etc.), and when follow-up is required ('spoke to the architect on the 5th, answer promised by the 10th'), or responding to a customer query as to how the job is doing ('at the brake – scheduled for forming today and welding tomorrow'). The system's flexible and extendible status tracking capabilities enhance productivity and customer satisfaction.

Reduction in engineering errors

The hollow metal industry has the characteristic that it produces components that can be ordered in a huge range of configurations of varying complexities. When one considers all the potential factors involved – profiles, wall conditions, fire label requirements, hardware types (and functions and revisions), installation options, material choices, acoustic and security properties, door construction, anchoring, etc., , it is no wonder that listing, detailing and fabrication errors are not uncommon. It also doesn't help that the original specifications often have mistakes and inconsistencies, and that further oversights can happen during the take off process.

Given that the industry also typically operates at low margins (exacerbated recently by the spike in material costs), one can appreciate just how expensive mistakes are. Not only have the original engineering and fabrication time and materials been wasted, but the disruption of repairing or reprocessing a mistake typically creates a much greater expense than that original investment. This is not to mention the charge backs that are so common in the industry and the damage to a company's reputation.

But the DRI system, properly configured, will dispassionately and untiringly process job after job applying the full set of rules to every configuration and every order regardless of complexity.

Simplified change order processing

It is not uncommon in this industry for order details to be changed after the order has already been started. A handing might change, a detail in a hardware set, a hinge location, etc.

With the DRI system, all that is required is that the order entry be changed to reflect the new information. Then a simple click of a button results in all appropriate reports, programs and other required changes being generated.

Spread Sheet Analysis Engineering Costs

Engineering Labor Savings

Just fill in the Salaries in the top table

Position	Present Number	Salary/Person	Salary/Position
Programmer Supervisor	1		$0.00
Programmer	4		$0.00
Engineer (Product)	2		$0.00
Customer Service/Order Entry	4		$0.00
			$0.00

With DRI Hollow Metal System

Position	Number	Salary/Person	Salary/Position
Programmer Supervisor	1	$0.00	$0.00
Programmer	0	$0.00	$0.00
Engineer (Product)	1	$0.00	$0.00
Customer Service/Order Entry	3	$0.00	$0.00
			$0.00

Savings/Year **$0.00**

Position	Sample Present Number	Salary/Person	Salary/Position
Programmer Supervisor	1	$70,000.00	$70,000.00
Programmer	4	$40,000.00	$160,000.00
Engineer (Product)	2	$60,000.00	$120,000.00
Customer Service/Order Entry	4	$30,000.00	$120,000.00
			$470,000.00

With DRI Hollow Metal System

Position	Number	Salary/Person	Salary/Position
Programmer Supervisor	1	$70,000.00	$70,000.00
Programmer	0	$40,000.00	$0.00
Engineer (Product)	1	$60,000.00	$60,000.00
Customer Service/Order Entry	3	$30,000.00	$90,000.00
			$220,000.00

Savings/Year $250,000.00

Shop

Elimination of operation specific job sorting

In an effort to streamline engineering, most hollow metal concerns use a single comprehensive traveler to inform the shop of the frames and doors to be fabricated. This traveler follows the job from operation to operation through the shop.

While this traveler is an efficient report for the final assembly of the product, it does not provide the information necessary for the intermediate operations to happen efficiently.

In most shops, the operator at each station takes time at the start of handling each new release to sort and compile the information in an order that will let him process it efficiently. The shear operator will look for all components of the same size out of a given material. The brake operator will look for all the parts that will be processed given a certain set-up on the brake. The turret operator will look for all parts that use the same turret configuration. Etc.

This is a time consuming process during which equipment and employees that might be key bottlenecks in the process are not producing.

The DRI prepares detailed reports that make it easy for each operator to run his process in the most efficient manner possible.

Reduction in Setups

The sorting done by each of the operators described in the previous section is also prone to errors.

For example, if a brake operator misses a component that requires a certain set-up, and goes on to another set-up, it might cost him hours to return to the original set-up to process the missed part.

Since programs are generated automatically, more can be done at the turret. For example, parts can be “handed” at the turret eliminating this as a set-up or processing consideration for the break operator. In another example, the turret can be program to add reference geometry for the alignment of parts for final assembly and welding, decreasing manual setups and improving part quality.

More efficient Processing

Whether by processing all work in the same manner as opposed to having separate lines for 'standard' versus 'custom' jobs, or by utilizing advanced methods such as nesting different parts out of standard sized blanks to maximize material utilization, minimize handling and maximizing turret productivity, there are many ways that the DRI system and consulting services can result in significant efficiencies on the shop floor.

Reduction in fabrication and assembly errors.

Clear, consistent and comprehensive documentation of every step in the process eliminates many errors caused by depending of shop personnel to interpret short hand notes and make assumptions of what is intended.

The system produces details, calculations, reference documents and other aids as needed to eliminate the need for people on the shop floor to figure things out themselves (with the commensurate percentage of errors).

Other Benefits

Reduced Dependence on 'Tribal Knowledge'

This is such an important issue that we have prepared a complete multi-media presentation on it available on CD or over the web.

'Tribal Knowledge' refers to the reliance on the experience and technique of individual employees to interpret and process orders.

Some hollow metal companies take this to a great extreme, sending order forms to the shop with only the most cursory description of what is being requested and depending on the shop to get it right. Almost all hollow metal companies we have evaluated depend to a significant extent on tribal knowledge in their sales, engineering and manufacturing processes.

While the historic reasons for this situation are diverse, it is dangerous and expensive. It makes a company vulnerable to catastrophic occurrences, saps quality and efficiency from operations, and decreases the value of the business. These problems will be covered in following sections.

The cure to tribal knowledge is the comprehensive systemization of product and method knowledge. The enabling of this capability in a manner that would deliver maximum independence from the hazards associated with tribal knowledge has been a fundamental goal in the design or DRI's package of software and services for hollow metal manufacturers.

Consistent Approach to Jobs

With tribal knowledge, the approach to quoting, engineering or manufacturing the job can vary with the particular employee performing that function. With the system handling these processes, the approach is always uniform and in accordance with the corporate policies.

Protection from 'key employee syndrome'

Since the company depends on the information particular employees have, it makes the company extremely vulnerable to their lack of availability due to vacation, sickness, quitting, etc. Should a dispute arise with such an employee, they are in a position to cause significant harm that management would be ill equipped to promptly detect.

Improved process tracking and auditing

As all the processes and methods are consistently and comprehensively defined and documented, it becomes possible to accurately track, audit and improve or correct them where necessary.

Rationalization of standards and methods

During the review of current methods and standards that is performed during the configuration of the system for a new customer, there is frequently the exposure of wrong assumptions, and processes that are inefficient or could be improved.

We have encountered numerous instances of procedures being applied to products to accommodate tooling or machines that hadn't been used for years, sometimes decades.

Often it is discovered that labeling procedures had been compromised, or that trade and legal standards had changed from what was being followed in the shop. In some cases the company was exposed to serious potential liability due to issues like this, that we were able to correct.

Improved manageability

The systemization of the bulk of information about the products built by and methods employed by the company, together with the enlightening reporting and analysis enabled by a truly integrated, comprehensive database, supports a rational and informed approach to management.

In some situations the system can significantly enhance the marketability of the company by expanding the range of management teams that could take over the company with confidence without themselves possessing the level of detailed expertise in hollow metal that would be required without such a system in place.

Decrease in skill level and experience for jobs

Since so much expertise is built into the system, less is required of the individuals performing the job function, whether it be in sales, take offs, listing, detailing or the shop.

Faster Turn Around Time

The processes that the system handles automatically are time consuming bottlenecks in many organizations. Plus, the system makes many operations in the shop significantly more efficient. The system can have a dramatic impact on the speed with which orders can be processed, produced and shipped.

In this industry, faster turn around times relate directly to the amount of work that can be sold and the profit margins that can be commanded.

Since the system handles complex elevations and profiles as seamlessly as simple ones, work that once needed to be handled as 'custom' now can be handled the same as 'standard'. Of course, custom prices can still be quoted.

Increased product offerings

With the introduction of automatic engineering, companies that might once have avoided certain product configurations either because their engineering departments couldn't handle them or because it would require too much of the engineering department's time can now readily accept those projects.

In addition, R&D can be done to develop new products and configurations. As they are developed and added to the DRI system's library of product families, each new product becomes a new 'standard' that can be as easily engineered and processed as any previously configured product.

The system can also enable a company to expand their line to include other variants of hollow metal. Perhaps a company doing commercial hollow metal would like to venture into security, or acoustic hollow metal. Our system and consulting can facilitate that process.

And the DRI system is capable of handling a broad range of products, even beyond the normal hollow metal offerings. The system is used for architectural grilles, elevator parts, radiators and many other offerings.

Improved product quality

Product design decisions have frequently been made to help streamline a manual engineering process. For example, entries in bend deduction tables were frequently rounded to the nearest convenient fraction. On profiles with numerous bends, this led to a significant cumulative errors. Miter angles might have been kept at 45 degrees when allowing it to float would have resulted in a better product.

Automation enables company to eliminate all such quality compromised that were introduced for engineering efficiency. The result is product with a much better fit and finish than what had been produced in the past. This will not only improve the appearance and function of the product in the field, but will reduce the amount of adjustments required by installers in the field.

Improved customer service

Reduced turn around time, handling of greater variations of product, better product quality and fit and finish, faster and more comprehensive and consistent document generation, better catching of mistakes and inconsistencies in customer orders, accurate and rapid response as to job status, all of these go to high customer satisfaction.

Ease of introduction of new standards, methods and tools

Typically, changes to products or introduction of new methods or manufacturing resources have forced companies without our system to create or modify many documents and machine macros, and train a variety of employees. This is a time consuming, error prone and difficult to manage and maintain process.

Centralization of information and automatic generation of documents and programs from one centralized data store have an enormous impact on the ease and reliability with which these changes can be introduced. A few examples are:

Hardware Templates

DRI has a unique methodology for representing all the functions found in a hardware template in a single drawing and database entry.

Tooling

Since the DRI system dynamically creates optimal programs based on an analysis of the part being manufactured and the available tooling, a new tool will automatically be utilized wherever it delivers a benefit simply by its addition to the tooling database.

New Machines

The addition of a new model or even differently configured or tooled turret requires only the addition to the DRI system of the complete description of the machine and sometimes the coordinated updating of some templates for the machine to be fully exploited. The same is true even for completely new technologies, such as Laser, Plasma or water jet cutting machines. Even completely different forming approaches such as roll forming can be introduced to a company with just an update to the central system.

Product and Standards changes

If a miter method changes, or the size of a hinge cut-out, or the bend deduction tables, or any other data element, a single change in the central system results in the change being implement company wide.

Reduced Errors

Duplicate Entry

Contradictory paper work

Stream lining operations

Many example of stream lined operations have already appeared elsewhere in this document. Some others include:

- Flexible machine or line selection: Since all programs and shop documentation are generated at release, then the selection of particular machines, a particular factory, or particular line to process a release can be done at the last moment.
- Reassignment of resources: If a machine that was originally scheduled for the job is unexpectedly occupied or unavailable, different resources can easily be selected and the job re-released.
- Back office processing: Computationally intensive release processing happens on an application server, and requires no human monitoring or intervention. So nobody's productivity is impacted during release processing. Since release processing is unmanned, it can also happen at night and weekends.

Case Histories

Comprehensive case histories are being developed. Here are a few initial revealing points.

Acoustic Company

The first company to use an early version of the system that covered order entry, submittal drawings, shop drawings and N/C programming (but with significant less flexibility and comprehensiveness as compared to the current offering experienced the following in the first year of use:

The department using the system went from 5 people processing 2.5 million worth of work to 3 people processing 6 million dollars worth of work. This does not include other benefits.

Once deployed, the system returned its cost in less than half a year.

Commercial Hollow Metal Company

As a demonstration of the immediate impact the system can make, a commercial hollow metal manufacturer had 6 programmers handling the N/C programming. With the first phase installation the average time per program dropped by more than 2/3 and they were able to reallocate people for other engineering and sales functions. With the installation of the 2nd phase of the project, N/C programming practically disappeared as a job function. One N/C person stayed as the person responsible for adding hardware to the library, defining new custom elevations, etc.

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