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FACILITIES AND ENVIRONMENTAL EFFECTS
SURFACE PREPARATION AND COATINGS
DESIGN/PRODUCTION INTEGRATION
HUMAN RESOURCE INNOVATION
MARINE INDUSTRY STANDARDS
WELDING
INDUSTRIAL ENGINEERING
EDUCATION AND TRAINING**

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Research**

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GROUP TECHNOLOGY/FLOW APPLICATIONS RESEARCH

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ABSTRACT

The general subjects of GT (group technology), production cells, and shop flow have been in the technical press for some time now. And the relationship to CIM (Computer Integrated Manufacturing) is also being introduced.

All of these concepts have much to offer the shipbuilder, but we need to relate these modern concepts to shipbuilding.

In this talk, we will describe these related subjects and the opportunities that shipbuilders have, a new look at CIM and GT from a shipyard perspective, and several proposed practical projects involving a machine shop and a sheet metal shop.

As we see it, many shipyard shops are set up in "departments", grouping similar machines based on the commonality of the machines. Another way is to group machines and processes based on the commonality of the groups of products being processed.

This different viewpoint may have a lot to offer us as shipbuilders in reduced costs and faster thruput.

Synopsis

The general subjects of GT (group technology), production cells, and shop flow have been in the technical press for some time now. And the relationship to CIM (Computer Integrated Manufacturing) is also being introduced.

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In this talk, we will describe these related subjects and the opportunities that shipbuilders have, a new look-at CIM and GT from a shipyard perspective, and several proposed practical projects involving a machine shop and a sheetmetal shop.

As we see it, many shipyard shops are layed out in "departments", grouping similar machines based on the commonality of the machines,

Or, even worse, sometimes our shops are not situated with any visible rhyme or reason.

Another way to lay out the shop is to group machines and processes based on the commonality of the groups of products being processed.

This different viewpoint may have a lot to offer us as shipbuilders in reduced costs, faster thruput and reduced WIP (Work-In-Progress inventory). Reductions in WIP will reduce the possibilities of lost and damaged material, especially in the Sheetmetal Shop: example shown later.

Just about all of American industry is looking for ways to improve productivity. It is not so much that we would like to make more profits as it is to survive.

An expert has been quoted to the effect that we have our choice of three alternatives:

- Automate - use robots, NC, computer control
- Imigrate - go offshore
- Evaporate - go out of business

These suggestions don't have a lot of attraction to us as shipbuilders, although automation may have a few possibilities.

But Group Technology/Flow Lanes presents a very interesting chance to improve our production situation.

The two of us did not start our career in a shipyard but we've become quite convinced that to the traditional list of production requirements of:

1. Trained, skillful manpower
2. A producable engineering design
3. The correct level of facilities and other staff support including planning, scheduling, and material/purchasing services.

We could call out another:

4. Group Technology or Process Lanes

First let's look at some definitions:

GROUP TECHNOLOGY

An engineering and manufacturing philosophy which identifies the "sameness of parts, equipment, or processes". It provides for rapid retrieval of existing designs and anticipates a cellular type production equipment layout.

ANSI

IEE

Slide #1

And while we're at it, here is one definition from Dick Price of Avondale Shipyards of a process lane:

PROCESS LANES CONCEPT

DEFINES:

THE PROCESS LANES CONCEPT MEANS VERY SIMPLY THE CATEGORIZATION AND SEPARATION OF "LIKE KINDS OF WORK", AND THE SUBSEQUENT DEVELOPMENT OF WORK CENTERS SPECIFICALLY DESIGNED TO EFFICIENTLY AND ECONOMICALLY PRODUCE THAT KIND OF WORK. PROCESS LANES ESTABLISH THE GREATEST AMOUNT OF "LEARNING CURVE" EFFICIENCY BY HAVING THE SAME PEOPLE AT THE SAME WORK CENTERS DOING REPETITIVE TYPES OF WORK EVERY DAY WITH THE SUPPORT OF A WELL ORGANIZED AND EFFICIENT FLOW OF MATERIAL.

As you can see, these are similar concepts both aiming at a production organization that situates its production flow in such a way that we try to do all similar functions in the same place with the same people and equipment, minimize Work In Process (WIP) and minimize material handling. Usually when we make small parts like sheetmetal fittings we call the organization a Process Lane (1).

So you say, "Ok so far, how do I go about implementing such a system, or even determining what it would cost?"

Here's our version of the steps involved, you'll have to work out your own costs.

1. INVENTORY YOUR PARTS

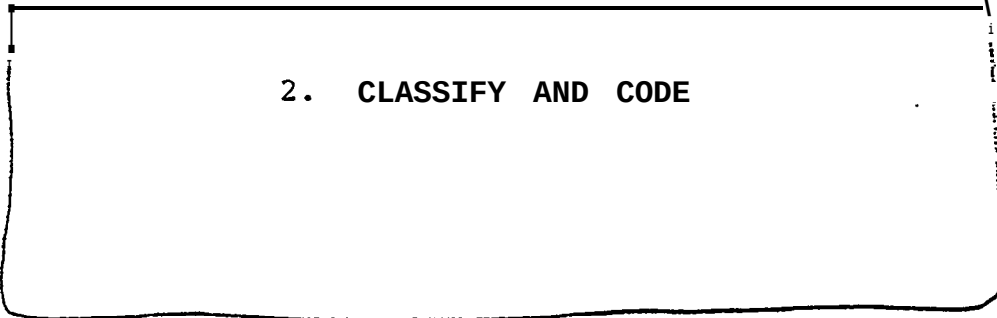
Slide #2

Likely candidates in a shipyard are:

- ' Sheetmetal assemblies
- ' Pipe pieces
- ' Steel units including fabricated parts (see 1).
- ' Machine shop components and repair jobs.

'This is a good place to involve the supervisor and shop personnel to help insure success in case you pick their area to work in, and to get their help in noting commonalities that you might not notice.

This is the step, however, where you "zero in" on your target.



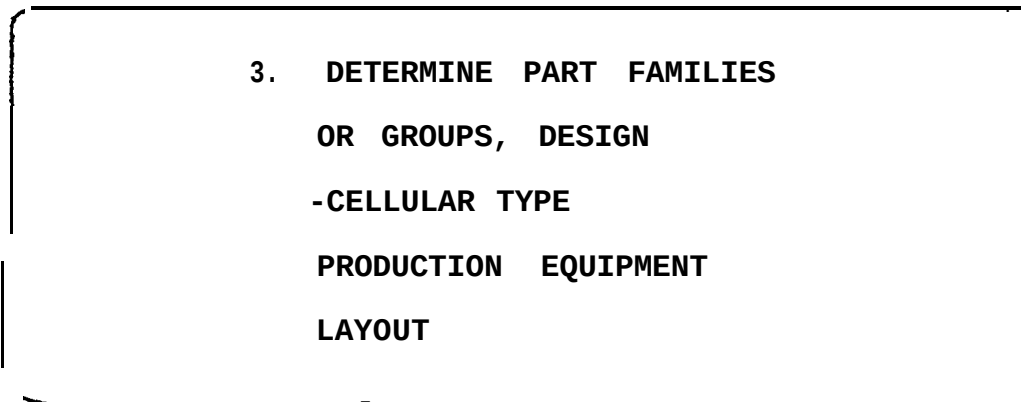
2. CLASSIFY AND CODE

Slide #3

This step can be as simple or complex as you need or want to make it. Surely you may want to have a computer-compatible code that preserves the "group" yet allows you to code that part in such a way that computer retrieval can be achieved. This is an essential first step for a CIM system.

Our suggestion is that you start simple and move to more complexity as your needs develop. After all, FLANGE in our Sheetmetal Shop is a classification and a code.

The words you use should carry the commonly used local expression if possible or be easily translated in to it.



3. DETERMINE PART FAMILIES OR GROUPS, DESIGN -CELLULAR TYPE PRODUCTION EQUIPMENT LAYOUT

Slide #4

This step is where you get down to the hardware. It might involve combining existing equipment, purchasing new, etc.

**4. IMPLEMENT AND INSTALL
YOUR MANUFACTURING
CELL**

Slide #5

After design, costing, and management go ahead here's where you organize your cell. Involve all people that will have anything to do with the cell. If possible, get the people that will operate the cell to take part, or at least keep them informed. This includes planning, scheduling, shop supervision and the journeymen.

**5. PLAN AND SCHEDULE
BY PROCESS LANES
THROUGH THESE CELLS**

Slide #6

By now it may have happened that you've noticed drawings that were not designed for producability. Go to Engineering and try to resolve the problem. Often, the way the part was designed may act as a constraint on your production process.

**6. DO YOUR PART TO
ACHIEVE DESIGN -
PRODUCTION INTEGRATION
FOR MANUFACTURABILITY**

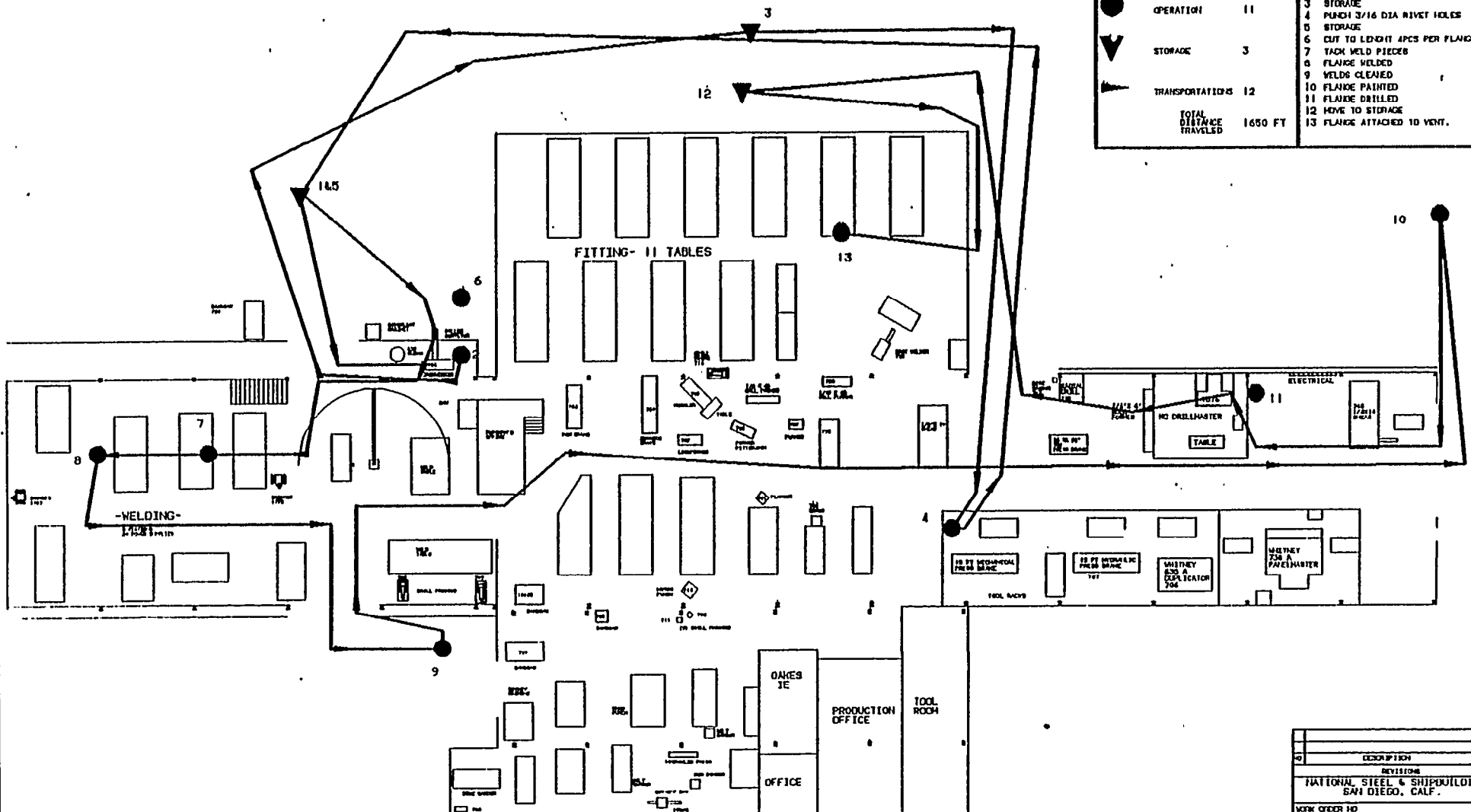
Slide #7

The next two pages show an example of one GT project at NASSCO. Most of you are familiar with the 1 1/2 x 1/8 angle iron flanges that are used with most sheetmetal assemblies. Note the hodge-podge flow on the first page.

Our GT version is on the second page. Note the simplicity.

EXISTING FLOW PROCESS FOR VENTILATION FLANGES

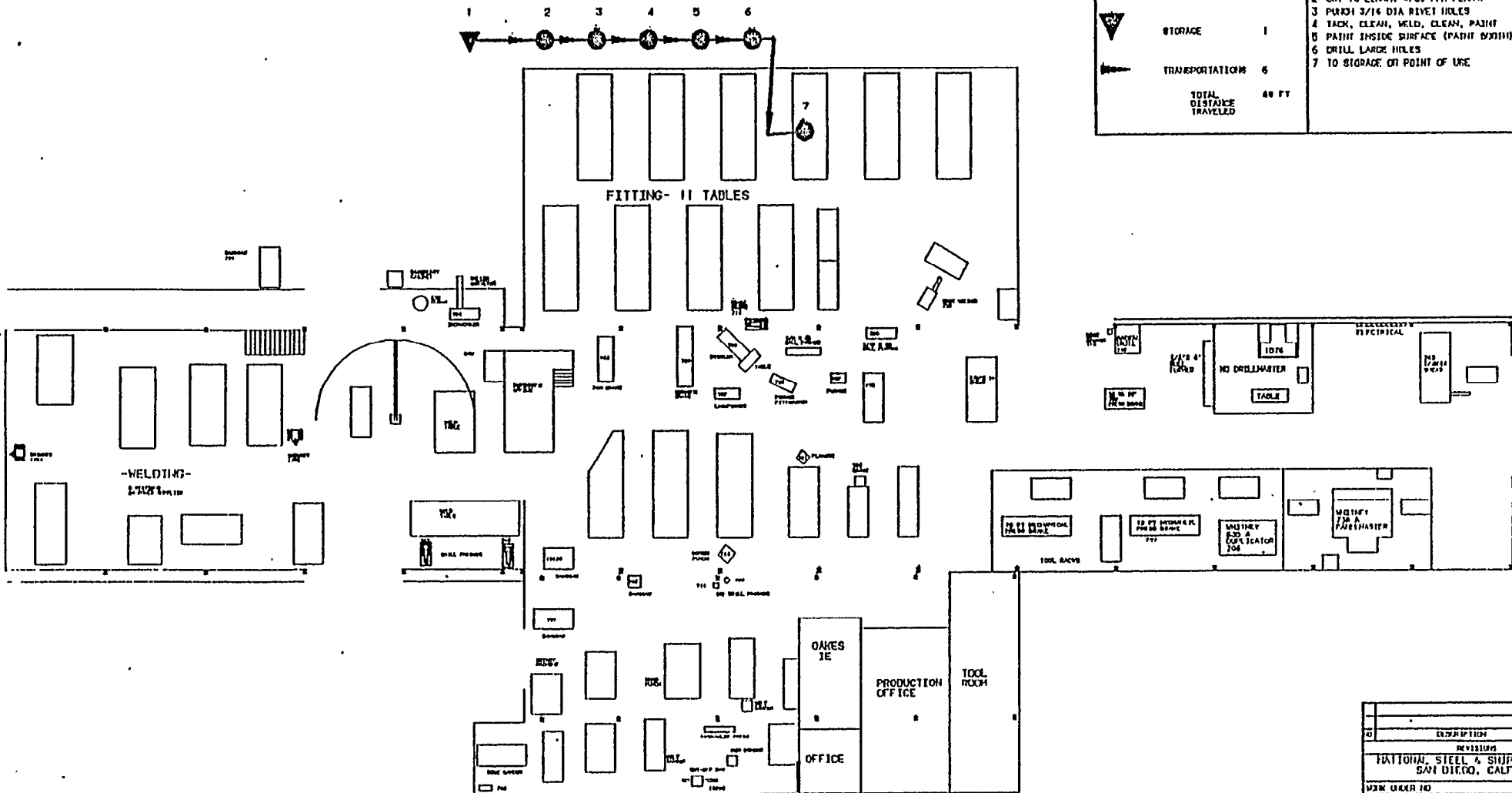
CHART SUMMARY		LEGEND
OPERATION	NUMBER OF OPERATIONS	
●	11	1 STORAGE AXLE IRON
▼	3	2 CUT INTO 10FT LENGTHS
▶	12	3 STORAGE
		4 PUNCH 3/16 DIA RIVET HOLES
		5 STORAGE
		6 CUT TO LENGTH APCS PER FLANGE
		7 TACK WELD PIECES
		8 FLANGE WELDED
		9 WELDS CLEANED
		10 FLANGE PAINTED
		11 FLANGE DRILLED
		12 MOVE TO STORAGE
		13 FLANGE ATTACHED TO VENT.
TOTAL DISTANCE TRAVELED		1650 FT



NO.	DESCRIPTION	DATE	APP.
REVISIONS			
NATIONAL STEEL & SHIPBUILDING CO. SAN DIEGO, CALIF.			
WORK ORDER NO.			
BLOG 7			
EXISTING FLOW PROCESS			
DESIGNED BY	CHECKED BY	APPROVED BY	DATE
10000	10000	10000	10000
SCALE 1/8" = 1'			

PROPOSED FLOW PROCESS FOR VENTILATION FLANGES

CHART SUMMARY		LEGEND
OPERATION	NUMBER OF OPERATIONS	
	1	1 STORAGE AREA IRON
	7	2 CUT TO LENGTH 4PCS PER FLANGE 3 PERFORATE 3/16 DIA RIVET HOLES 4 TACK, CLEAN, WELD, CLEAN, PAINT 5 PAINT INSIDE SURFACE (PAINT DRYING)
	1	6 DRILL LARGE HOLES
	6	7 TO STORAGE OR POINT OF USE
TOTAL DISTANCE TRAVELED		88 FT



- 45 -

REVISION		DATE
NATIONAL STEEL & SHIPBUILDING CO. SAN DIEGO, CALIF.		
WORK ORDER NO.		
BLOG 7		
PROPOSED FLOW PROCESS		
DESIGNED BY	APPROVED BY	DATE
DRAWN BY	CHECKED BY	DATE
SCALE		

In addition to the expected higher productivity we expect to achieve:

- 1. Just-In-Time so that the flange is ready exactly when needed - not sooner (storage problems); not too late (holds up schedule).**
- 2. No lost flanges. When complete they go to the assembly.**
- 3. Reduced clutter in the rest of the shop. Right now we have dozens of flanges and parts lying around.**

We have also worked up a GT/Flow Lane for the repair of butterfly globe, and gate valves.' Using the same principles outlined above, we expect:

- 1. Improved flow and movement of material**
- 2. Improved processing speed**
- 3. Closer supervision and production control**
- 4. Increased standardization of work procedures**
- 5. Production rate increase of 25% to 35%**
- 6. Maintenance of flexibility**

And what can you expect?

ADVANTAGES TO SHIPBUILDERS

- SHORTENED MATERIAL FLOW PATH**
- ADVANTAGES FROM A CODING SYSTEM**
- EASIER PRODUCTION CONTROL**
- REDUCED PRODUCTION COSTS**

Slide #11

Caveat:

As Mr. G.M. Ranson put it in his classic Group Technology (2) " i t is all very well to have reconstructed the manufacturing scene according to G.T. with an ordered and measurable production facility, but we now require people to operate it". Watch out for proprietary feelings or reversion back to the former way of doing things.

Conclusion:

What we've talked about is just the plain old industrial engineering we all know about - applied common sense. Try it!

References:

- (1) Richard A. Price, Process Lanes Feasibility Study (U.S. Dept. Transportation, Maritime Administration, 1984)
- (2) G.M. Ranson, Group Technology, (England, McGraw-Hill Book Company (UK) Limited, 1972)
- (3) Society of Manufacturing Engineers, Group Technology Seminar, (Dearborn, Michigan, SME, 1984)

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