



MARCH 1996

HARRIS CORPORATION DRACON DIVISION

DESIGN FOR MANUFACTURABILITY WORKSHOP

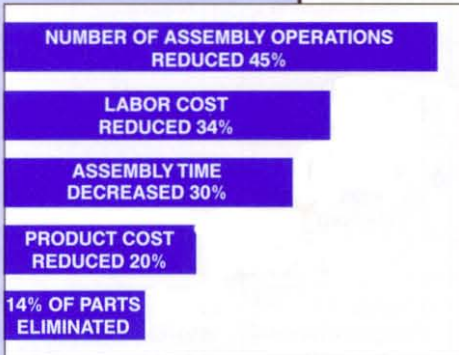
COMMUNICATIONS SECTOR MANUFACTURING COUNCIL INVOLVEMENT
SUPPLIER INVOLVEMENT & CROSS-FUNCTIONAL INVOLVEMENT

Design for Manufacturability Workshop Provides Springboard for Product Improvement Ideas

It was a time for exchanging ideas and challenging one's imagination during a 3½-day gathering at the Oxnard Radisson Hotel. The event, which took place December 18–21, drew Harris design engineers, planners, marketing executives, communications sector personnel, accounting experts, manufacturers and suppliers. All had come together to discuss ways to cut manufacturing costs for the Liberte project—the new TS-120 international test set.

Known as the "Design for Manufacturability/Design for Cost Workshop," it was conducted by Munro and Associates, Inc. This consulting firm specializes in helping companies to significantly reduce product manufacturing costs by applying Design for Manufacturability (DFM) principles. Participants came not only from Harris Dracon, but also from the Harris Farinon and Broadcast divisions. Suppliers such as UMEC, the final assembly and test supplier for the TS-120, attended from as far away as Taiwan.

The results bear out the success of the DFM workshop. During the session, participants were able to reduce the number of assembly operations by 45%. More than 14% of the parts were eliminated from the original number. Assembly time decreased by more than 30%, while the labor cost was reduced by 34%. Through their efforts, participants lowered the total product cost by nearly 20%.



Positive results from the DFM workshop.

Small Groups, Big Ideas

For the hands-on sessions, Munro consultant Dan McCarthy broke the participants up into small groups and encouraged everyone to generate his or her own ideas about saving manufacturing costs by reducing labor and parts or by changing methodologies. He presented them with a sample product to test their thinking processes and assisted participants in pulling together assembly diagrams.

"Dan gave us some new methodologies and conceptual tools for more efficient product assembly," said attendee Ted Chavannes, a Harris Dracon electrical engineer who participated on the printed circuit board team at the workshop. "It was a good session, especially for design engineers. And I think the interaction with suppliers and key management people will prove to be a big help as we go through the redesign process."

Bob Butler, a principal engineer with Harris Broadcast in Quincy, Illinois, was flown in to lend his years of experience to the whole mix. After the session, Butler echoed Chavannes' sentiments.

"I've been in value engineering for 37 years and I've always felt it's good to get a variety of views and perspectives

when developing a product," Butler stated. "I had already done my own analysis before the workshop and this confirmed some of my findings. It's a big advantage to assess the process while it's still in the developmental



Dan McCarthy, Munro & Associates, challenges the team to consider new approaches.



Supplier UMEC influences the PCBA team's design approach.

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Small Groups, Big Ideas (Continued from the previous page.)

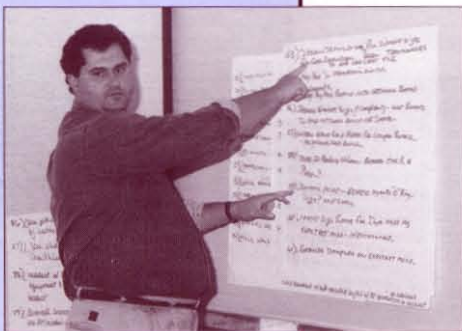
stage, rather than after it has all been done. And I think the workshop provided some good insights to the people who will be working on the TS-120."



Final assembly team prioritizes their 96 (wow!) improvement ideas.



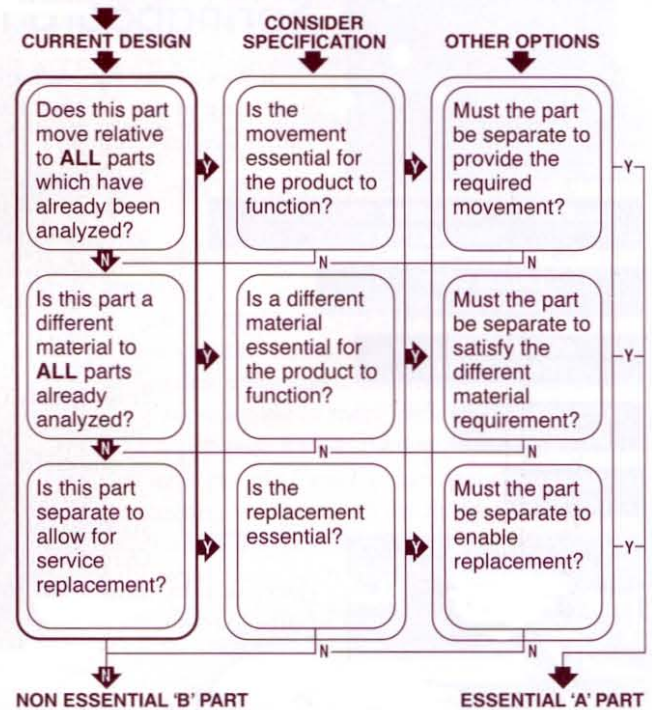
Line card/belt clip team brainstorms new approaches. Harris Farinon engineer, Jerry Hammes leads the way.



Mechanical engineer, Ed Zoiss clarifies suggestions.

When in Doubt...Throw it Out!

How to determine if a part is essential or non-essential



GRAPH DESIGNED BY MUNRO & ASSOCIATES, INC.

Good Design Principles

- Teamwork: The Difference Between Good and Bad Designs
- Minimize the Number of Parts
- Design So the Assembly Process Can be Completed in a Layered Fashion, Preferably from Above
- Design Mating Parts that are Easy to Insert and Align
- Avoid Expensive Fastening Operations
- Design Out Handling Problems, Bulk Storage is the Ideal
- Design the Product for "Poka Yoke" (Error Proof)
- Design the Parts to Fixture Themselves One to Another
- Simplify Service and Packaging
- Eliminate Adjustments and Reorientations

("Good Design Principles" cards are available through Munro & Associates, Inc. © 810-362-5110.)

An Equal Voice

By emphasizing a teamwork approach, the DFM workshop gave everyone an equal voice. Though a variety of different departments and disciplines were involved, the focus was universal—to maintain high product quality, while reducing the labor, costs and manufacturing cycle times. To do this, McCarthy encouraged participants to cast aside conventional approaches and routine formulas.

(Continued on the following page.)



An Equal Voice (Continued from the previous page.)

"It was important to establish the right mind-set," said McCarthy, a manufacturing consultant for more than 15 years. "Normally, the idea is to put a band-aid of sorts on a design to solve a problem, but this only creates an additional problem. What we wanted to do with the TS-120 was eliminate things, not add them."

In order for the workshop participants to identify the waste in the design, McCarthy had to make them aware of all that was involved with creating the product. Then each part's existence had to be justified, which meant it had to meet one of three different criteria: it had to have separate movement that was essential for the product to function; it had to be separate to satisfy a different material requirement; or it had to be separate to enable service or replacement.

"This was what we call an integration workshop, where sub-teams focus on different areas of the same product and integrate their efforts back into one cohesive product design," McCarthy said. "Each sub-team is composed of engineers, planners, marketing and suppliers."

Besides UMEC, other suppliers in attendance included Cooner Wire, which is supplying the line cord for the TS-120; Hamilton/Hallmark, the world's largest electronics distributor; and Phillips Plastic, the company that is making the soft tooling for the TS-120. These suppliers displayed a high degree of cooperation, in looking for practical ways to reduce costs on the TS-120.

"Our engineers did a preliminary analysis," said Steve Smith, vice president of Cooner Wire. "And when we arrived at the Radisson, we had some ideas as to how we could eliminate a few parts that would bring down the cost. Consequently, we removed some items from the cord. The workshop itself was very instructive, but now we'll have to wait for the next proto-type stage to see the actual results."

Denny Ackmann, Regional Sales Manager for Phillips Plastic and a strong advocate of DFM, was impressed that Harris had the foresight to implement this program.

"I think there are obvious advantages to working together on a project like this," said Ackmann. "By having the various suppliers in attendance, we were able to provide insights into the feasibility of various cost-cutting measures. I think it's a mistake, however, to base everything on cost. Every factor should be considered for its ultimate impact on the product."



Adi Adisaputro and William Lin (UMEC) team up to evaluate assembly techniques.



Denny Ackmann from Phillips Plastic leads tooling discussion.

Manufacturing Council Helps Set the Process in Motion

When Marketing Manager Linda Hathorn informed Alex Eksir, Harris Dracon's Director of Quality and Operations, that the initial manufacturing costs for the TS-120 were too high, he decided to bring in an outside consultant. Harris Dracon Materials Manager Scott Cameron and Eksir worked together to determine which consultant to utilize and chose Munro and Associates. While Cameron began involving suppliers and forming the team, Eksir proposed the DFM workshop to the Manufacturing Operations Council. Harvey Baker, the council chairman from Harris Broadcast, and Doug Carlberg, council member from Harris Farinon, quickly endorsed the idea. Division GM Tom Erdmann not only supported but also encouraged this approach.

"This was a true illustration of the council working together as a team and looking after each other's welfare to get tangible results," said Eksir. "Harvey and Doug were very supportive throughout the entire process."

Not only did Baker and Carlberg like the idea, but they also sent their own engineering experts, Bob Butler from Broadcast and Jerry Hammes from Farinon, to the 3½-day event.

"It was a total effort of cooperation," Eksir added. "Suppliers and partners came from all sides of the map to participate. And it was done in the spirit of goodwill."

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*For inquiries contact:
Scott Cameron, Manager,
Material Administration
Operations Core Team*

*809 Calle Plano
Camarillo, CA 93012
Phone: 805-389-2309
Fax: 805-987-2361*



Positive Responses

"Everyone seemed to have a real good feeling about this workshop," said Cameron. "Even in the session itself, though it was spirited, there was a sense of camaraderie and of working together. The engineers who provided the initial design on the TS-120 could have been extremely defensive when changes were being suggested. But they were very receptive."

One of those engineers was Cris Pratt, Project Engineer for the TS-120. Pratt, one of the main coordinators of the workshop, met with consultant McCarthy before the event and discussed what would take place. In talking with McCarthy, he recognized that this would be a constructive exercise in which any kind of suggestion would be at least considered.

"I think the workshop was especially valuable for the mechanical engineers," Pratt stated. "It was effective in reducing our parts count. The TS-120 is a relatively low-cost product, so we had to make it inexpensive to produce."

Pratt did his own research before the workshop and had some new ideas of his own to suggest.

"Everyone contributed," said Pratt. "Each person volunteered for one of the three major groups: printed circuit board, final assembly or line cord and belt clip. We broke our recommended changes down into three areas that included low risk changes, higher risk and those that were a stretch—the more exotic or more difficult. We also figured in each step of the manufacturing process and how much time it took, then attached labor costs to see how much could be saved at every step. I think that most people found it quite enlightening."

Pratt felt that one of the most important results of the meeting was getting "buy in" from all of the parties involved, including marketing, management and all of the key suppliers.

"Cris was very instrumental in keeping plans for the workshop on track," said consultant McCarthy. "Before this session ever became a reality, he worked very hard to see it go through because he believed in the process. And that cooperation from engineers was key throughout the workshop, too."



Final assembly team intent on finding new ways to design the product.

Brainstorming for Solid Results

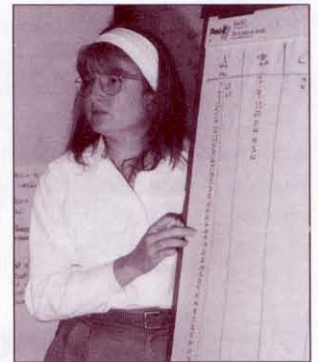
On the marketing side, Linda Hathorn was highly supportive of the process. Hathorn, Harris Dracon's Marketing Manager, liked the idea that everyone had ample opportunity to voice his or her ideas.

"It was a true brainstorming session," said Hathorn. "Everyone got a chance and no ideas were ridiculed. I think it was important to bring in the different departments because they all look at things from different perspectives. Consequently, the engineers and designers were able to look at the project through new eyes."

Dracon General Manager Tom Erdmann offered a final message of support when he said, "I would like to thank all of the Dracon employees for their enthusiastic participation in the Design for Manufacturability Workshop for the TS-120 product. Having had the opportunity to be present at the final team presentation and wrap-up session, I was especially pleased with the cooperation and teamwork amongst the engineering and operations department. I encourage this type of interaction, as it is key to our successful introduction of new products. Furthermore, I would like to express my special thanks to the sector participants Bob Butler from Broadcast Division and Jerry Hammes from Farinon; as well as the suppliers UMEC from Taiwan, Phillips Plastic, EECHO and Cooner Wire Company for their participation."

Consultant McCarthy emphasized the importance of conducting such an exercise at the earliest possible stage of product development. He reminded everyone that a product gets to market faster when the design only has to be done once, rather than twice or more.

It was left to Alex Eksir to put the final spin on what had taken place. "I liked the simplicity and practicality of the workshop approach," Eksir said. "Simple, but effective."



Linda Hathorn helps prioritize the final assembly team's ideas.



Final assembly team develops "assembly diagram."