Machine Maintenance

Integrated Performance Support System

Federal Manufacturing & Technologies

Maribeth C. Bohley and

Mary E. Schwartz

KCP-613-6028

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Final Report/Project Accomplishments Summary

National Machine Tool Partnership Agreement #950325

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Date: 9/28/97

Revision: 0

A. Parties

The project is a relationship between

AlliedSignal FM&T

Kingsbury Corporation

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Kansas City, MO 64141-6159

B. Background

Members of Kingsbury Corporation discovered that industrial customers often contacted the Kingsbury technical support department for routine maintenance and repair questions. Since Kingsbury provides an operations and maintenance manual with every machine, they determined that operators were not using their manuals. Additionally, they were receiving numerous calls about problems with basic machine systems such as lubrication. Consequently, Kingsbury technical staff determined that the machine tool operators were not performing daily, weekly, monthly, or annual maintenance checks on the Kingsbury machines. These problems led to increased downtime for industry and increased technical support costs for Kingsbury. They needed to find a way to provide machine operational and maintenance support on an international level in order to reduce these costs.

AlliedSignal Federal Manufacturing & Technologies (ASFM&T) determined that a **preventive** maintenance checklist, **an on-line manual** and **a** troubleshooting system, displayed on the machine's controller screen for the machine tool operator, could result in reduced downtime costs for the industry and technical support costs for Kingsbury.

C. Description

The objectives of this partnership project were to develop **a preventive maintenance checklist program**, a troubleshooting system for the Vertical Turning Center (VTC)-5, **an on-line manual, and to integrate these** components with a custom browser **that would run on the VTC-5 machine's controller and would support future internet/intranet delivery.**

Kingsbury provided subject matter experts from engineering, manufacturing, and technical support. They also provided photographs, schematics, and CAD drawings, which ASFM&T digitized for use in the final program. Information from The Kingsbury troubleshooting experts were interviewed regarding symptoms and root causes of system malfunctions. This knowledge was captured and, and from it, fault trees were developed. These trees were then incorporated into the EPSS as a troubleshooting tool.

The troubleshooting portion of the system presents simple questions to the machine operator in order to determine the likely cause or causes of malfunctions and then recommends systematic corrective actions.

The on-line reference manual, covering operations and maintenance, provides text and illustrations to the machine operator in a traditional structure, but additionally offers the capability to search voluminous amounts of technical data and retrieve specific information on request.

The maintenance portion of the EPSS includes checklists that are displayed daily, weekly, monthly, and annually, as appropriate, on the VTC-5 controller screen. The controller software is unavailable for machining parts until the machine tool operator goes through and checks off all of the checklist items.

This project provided the team with a detailed understanding of the knowledge and

information required to produce and support advanced machine tools. In addition, it resulted in the design and construction of a prototype VTC-5 EPSS containing all the logic and interfaces necessary to integrate operations and maintenance information from other Kingsbury machine tools.

D. Expected Economic Impact

Kingsbury expects to apply the developed technology to most of their **VTC-5** product line, allowing more efficient use of experts to address engineering challenges and spend less time on recurring and routine technical support problems. By running on the same computer platform that controls the machine tool, this software solution allows the machine operators to independently troubleshoot and repair malfunctions, as well as visually review the proper methods of performing specialized tasks without requiring intervention by Kingsbury technical support staff. This decreases Kingsbury's support costs at their factory and service support costs in the field.

E. Benefits to DOE

This partnership has expanded DOE's understanding of the process involved with capturing knowledge across a manufacturing operation and designing an appropriate troubleshooting system making critical information available as needed. This experience can be shared with other government agencies and offered as a model for an approach to matching the characteristics of a troubleshooting system to the target industry. Manufacturing operations both inside and outside of the Nuclear Weapons Complex can adopt this model.

A time-based preventive maintenance checklist, an on-line manual, and a troubleshooting system will enhance a systematic approach to **preventive** maintenance management. These integrated performance support programs are applicable in the DOE manufacturing environment by providing just-in-time information on the shop floor. This will improve production efficiency, result in less machine downtime and longer machine tool life, and reduce manufacturing costs. These integratable software programs are also available for adaptation and implementation by DOE and its contractors in support of DP efforts._

F. Industry Area

Manufacturing (including Automotive, Aerospace, Machine Tool builders/users). The troubleshooting system approach ensures that validated procedural information is presented to all users in a consistent way, thereby minimizing variations in processes. The EPSS can maximize productivity while minimizing capital costs, reduce the cost to manufacture products, deliver more products in less time and for less money and improve efficiencies to make industry more competitive. If generally applied in the aerospace and automotive industries, this EPSS can enhance profits through higher productivity and reduced costs resulting in a more secure business future for these industries.

G. Project Status

The project was completed as scheduled.

H. Point of Contact for Project Information

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I. Company Size and Point of Contact

James L. Koontz, Chief Executive Officer

Kingsbury Corporation

Company size: 450

1(603)352-5212

1(603)352-8789 fax

J. Project Examples

A functional demonstration CD-ROM is available that illustrates the technologies incorporated into the troubleshooting system design.

K. Technology Commercialization

None.

L. Release of Information

I have reviewed the attached Project Accomplishment Summary prepared by AlliedSignal FM&T and agree that the information about this project may be released for external distribution.

Original signed by Neil P. Coughlin 2/24/98

Name: Neil P. Coughlin Date

Organization: Kingsbury
Corporation

Title: VP Sales & Marketing