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CATSIR Computer Aided Tanker Structures Inspection and Repair Planning

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ABSTRACT

CATSIR (Computer Aided Tanker Structures Inspection and Repair) is a program developed for recording and manipulating inspection and repair data for tanker structures. It links a database program with a customized AutoCAD program. It allows a user to display information either on drawings or in a report format.

CATSIR was developed for Chevron Shipping Company to simplify the management of inspection and repair data on tanker structures and to improve the efficiency and the quality of planning of tanker maintenance. It stores large volumes of data in an easily accessible format and allows data manipulation, steel, and coating calculations and automatic repair and inspection report generation.

INTRODUCTION

Inspection and structural maintenance of tankers involves large amounts of data, including information on coatings, cathodic protection of tanks, possible corrosion of steel, structural defects, and repairs made on the structure. Careful recording and analysis of this data is important for the ship owner for effective planning of the vessels' maintenance program. Quality of the maintenance work can be improved if the maintenance history of the vessels, such as records of coating work and information on critical areas requiring special attention, is readily available.

To improve and simplify the management of inspection and repair data, Chevron together with Solus Schall, a software development division of Ocean Systems Engineering, has developed a PC-based computer system called CATSIR (Computer Aided Tanker Structure and Repair). CATSIR links a database program with a customized AutoCAD drafting program thus allowing storage of data both in graphic and in database format. CATSIR is designed to be used by inspection teams to record survey data, by owners to analyze the data and to prepare repair specifications, and by shipyards to document repair work.

CATSIR development started several years ago and has now reached a point where Chevron and its contractors are using the program to prepare repair specifications and record inspection and repair data. This paper gives a short description of the development and the capabilities of the program and discusses the experiences Chevron has had so far in using the program in practice.

PROGRAM DEVELOPMENT

The CATSIR pilot program was initiated in 1986 by Chevron Shipping Company to evaluate the feasibility of an AutoCAD-based computer program to record inspection data during a voyage survey. This lead to a development of CATSIR Version 2.0. The transfer of inspection data between the database side and the AutoCAD side of the program was improved. A steel renewal module, a coating module, and a defects module were added to the program and a customized AutoCAD menu was designed to make the program easier to use.

CATSIR 2.0 delivered in 1989, is the currently used version of the program. Figure 1 illustrates the program structure. To be able to use the program, the structural drawings of a ship class must be drawn into scale in the AutoCAD part of CATSIR. Structural components, for example, stiffeners, can be given attributes, such as a unit weight and a unit area, which will allow a user to carry out various calculations in CATSIR. Since the drawings are drawn in scale, areas specified by the user can also be determined. The steel renewal module is designed for determining weights of renewed plating, stiffeners, and other structural members. New steel or doublers can also be added, and their weight is automatically calculated. In the coating module, the user can specify the structure to be coated, and the program will calculate the area. Anodes can be placed on the drawings, and the program will take care of the bookkeeping. The thickness readings and defect information entered

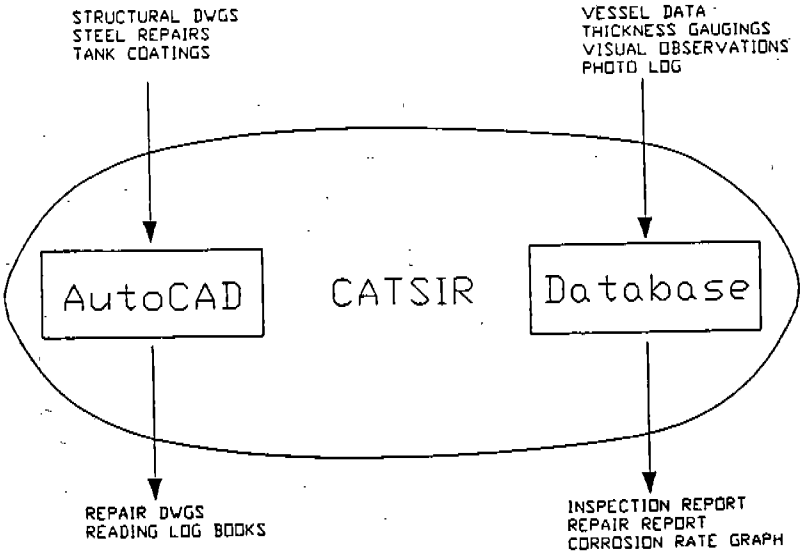

Figure 1: CATSIR Program Structure

in the database can be displayed on the drawings. Figures 2 and 3 are examples of typical CATSIR drawings.

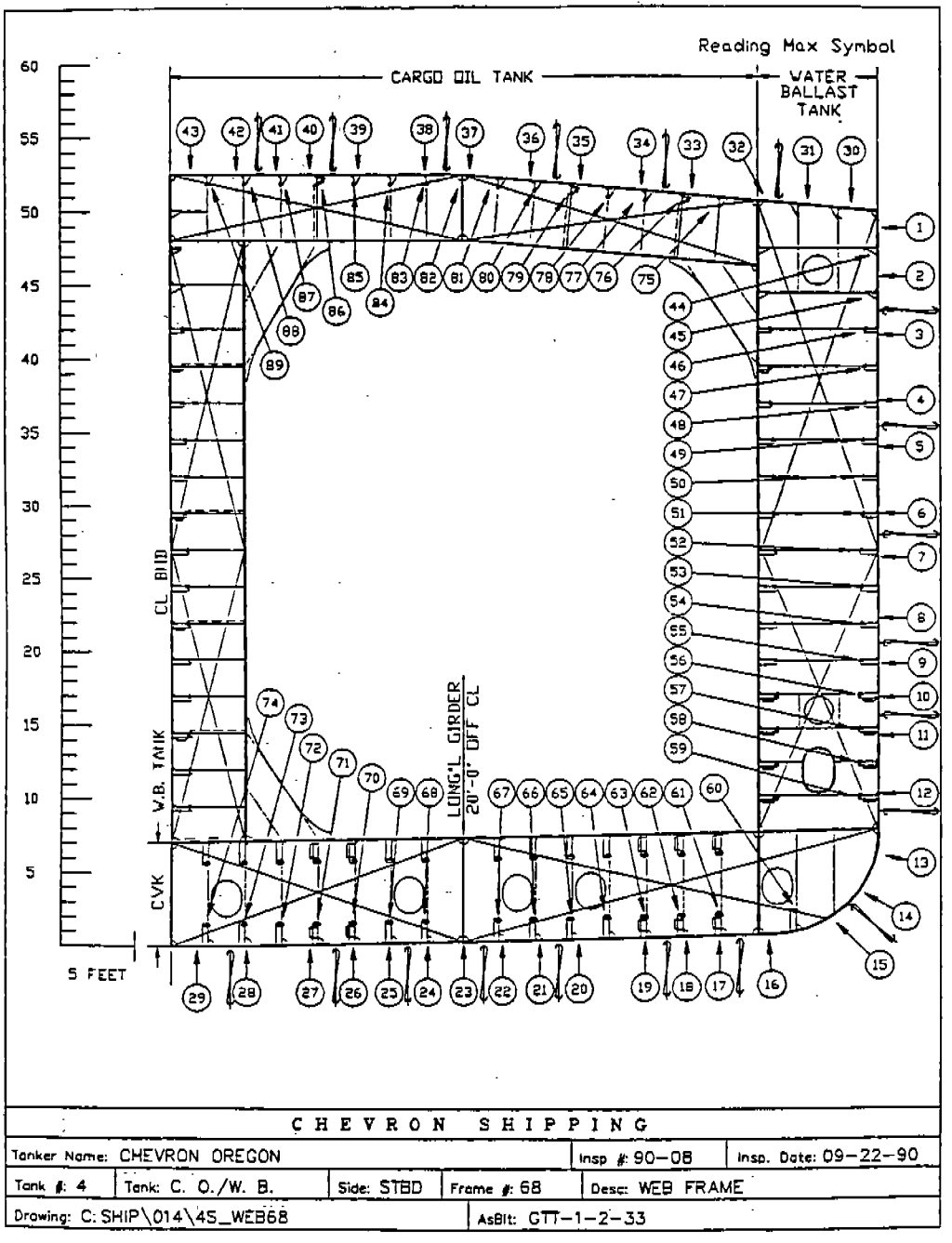

Figure 2: CATSIR Drawing Displaying Thickness Readings

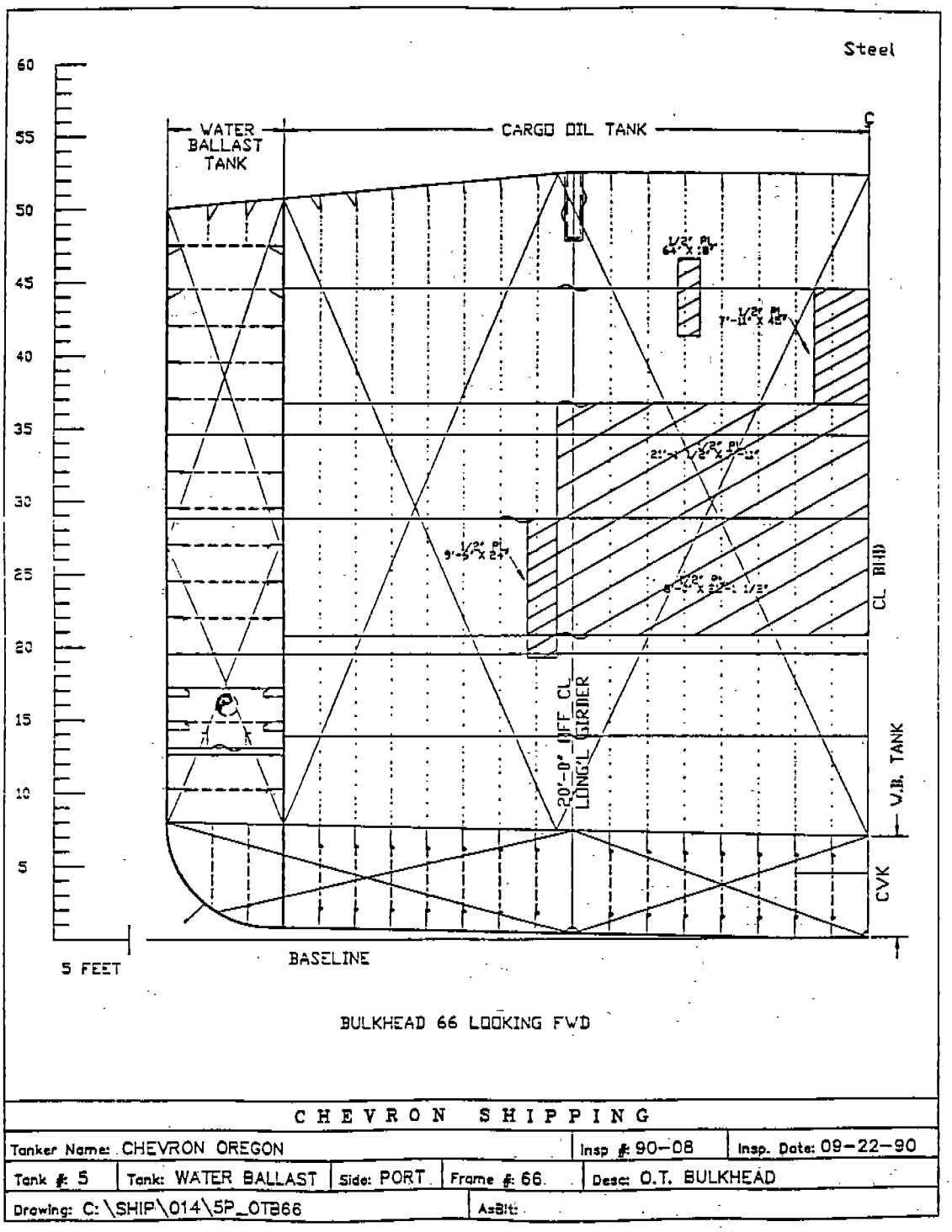

Figure 3: CATSIR Drawing Displaying Steel Repairs

CATSIR uses the structure of AutoCAD to store data in various layers. The data is identified by an inspection number which separates information entered at various times. The inspection and repair history can thus be stored on the same drawing. Under a given inspection number, various data types are again stored to different layers. The user can display the layers of interest and freeze all other layers. The layer structure allows storage of large amounts of data on one drawing without making the drawing impossible to interpret.

All the information added to the drawings can be transferred to the database. Also the database side uses the inspection number identification to file the data under a specific survey or repair. The data can be searched and manipulated in the database. An example of a data manipulation is filtering of thickness readings. The user can specify the percentage of wastage above which the readings are displayed. Filtering allows the user to reduce the amount of information on a drawing. The user can generate a report which will give a detailed record of the entered data. The drawings and the report form the final CATSIR document.

Chevron and Solus Schall are currently developing CATSIR Version 3.0. The major enhancements to be incorporated in the new version include the use of a new database program which will have additional data fields, improved reporting capabilities, on-line help system available to the user at all times, graphic display features and a capability of displaying drawings either in metric or in English units. The release of the new version is expected in the early 1991.

PROGRAM APPLICATIONS

CATSIR can be used in various stages of a vessel's maintenance cycle. Its main applications are the following:

Recordings of Data During A Voyage Inspection and Generating a Survey Report:

- The inspection team does not need to draft drawings since the structural drawings are always accessible in CATSIR. Use of CATSIR will also eliminate a draft report prepared during a voyage. In the future, the inspection data can be sent electronically to the Home Office thus improving the communications between the inspection team and the Home Office.

Preparation of Steel Repair Specifications for Periodic Overhauls:

- Steel and coatings can be specified on CATSIR drawings and steel weights and coating areas are calculated automatically. If the inspection information and the maintenance history is stored in CATSIR, all information needed for preparing the specification is readily available on the computer screen. The CATSIR report and drawings can then be produced and attached to a repair specification either as a

hard copy or as a computer file.

Reporting of Inspection and Repair Data During a Periodic Overhaul:

- The steel repairs, coating work, and installed anodes can be directly entered in CATSIR which will automatically calculate total steel weights, coating areas, and the total number of anodes. This will greatly reduce the bookkeeping associated with structural repairs. All work done on a ship is stored in a single location which will allow an easy access to the data at any time.

Chevron has used CATSIR so far in the two latter applications. The experience in using CATSIR in the specification work has been very positive. The time consuming manual steel and coating calculations are eliminated, and steel weight estimates can be given as soon as the inspection information is available for the vessel.

Use of CATSIR during a periodic overhaul presents a rather radical change to the existing practice, and the persons involved are not always familiar with computers. Important factors in a successful application of CATSIR in a repair yard environment is training of CATSIR users and a team work between the yard, the inspection team, and the ship owner. Chevron has introduced CATSIR on a few overhauls as a support to the existing record keeping. The repair data has been entered in CATSIR mainly after the overhauls as all members of the team have become familiar with CATSIR. Overall CATSIR has been received with enthusiasm and we have high expectations for its use in the future. Figure 4 is a sample from a periodic overhaul report.

Note: Figure 4 to follow as Attachment A

Our future goal is to enter inspection and repair data in CATSIR as soon as it becomes available so that this information is accessible by the Repair Superintendent and the shipyard personnel immediately. To achieve this goal we need to put more emphasis on the following:

- Program users need more training and experience in the program use.
- CATSIR drawings must be thoroughly tested so that the user does not encounter problems with them.
- User friendliness of the program must be further increased.

The next step in our CATSIR applications will be the use of the program to enter inspection data during voyage inspections. Before this is attempted the inspection teams must be well-trained in CATSIR use as they are without program support while underway.

A current application for CATSIR is to prepare critical areas inspection plans required by the U.S. Coast Guard for TAPS trade vessels. CATSIR offers an excellent way to record history of fractures and repairs, and it is a document

that can be easily updated after each inspection.

CONCLUSIONS

CATSIR has an ability to store large volumes of data in an easily accessible format. It also has data manipulation, calculation, and reporting capabilities useful for generating repair specifications and reports. Since all information is in an electronic format, this information can be transferred fast between inspection teams and the Home Office as well as between the Repair Teams and the Home Office. CATSIR simplifies the management of data involved in inspection and structural maintenance, which in turn will increase efficiency in the planning of tanker maintenance and improve the quality of the inspections and repairs.

Chevron is using CATSIR to record inspection and repair data. After the initial training and development phase it will become an integral part of Chevron's tanker structures' inspection and maintenance program.

ACKNOWLEDGEMENTS

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Chevron Shipping Company

ATTACHMENT A

WALL THICKNESS SURVEY REPORT

SEARCH EXPRESSION :-

Output Drawing = "2pudp_77"

CHEVRON OREGON Inspection No. : 90-08 Date : 08-14-90

Tank No. : 4 Tank : WING Side : PORT

Frame No. : 68 Description : GIRTH BELT As Built Dwg. :

Drawing : 4P_WEB68

Structural Member	Steel Type	Lctn. No.	Reading No.	Original Thickness	Current Thickness	Units Lost	% Red	Avg % Red	Allow % Red	Photo No.	Note No.
SIDESHELL	AH36	1	1	0.880	0.890	-0.010	-1	-1	0		
SIDESHELL	AH36	2	1	0.880	0.890	-0.010	-1	-1	0		
SIDESHELL	MILD	3	1	0.650	0.660	-0.010	-2	-2	0		
SIDESHELL	MILD	4	1	0.650	0.660	-0.010	-2	-2	0		
SIDESHELL	MILD	5	1	0.650	0.650	0.000	0	0	0		
SIDESHELL	MILD	6	1	0.650	0.660	-0.010	-2	-2	0		
SIDESHELL	MILD	7	1	0.650	0.660	-0.010	-2	-2	0		
SIDESHELL	MILD	8	1	0.650	0.640	0.010	2	2	0		
SIDESHELL	MILD	9	1	0.650	0.640	0.010	2	2	0		
SIDESHELL	MILD	10	1	0.650	0.650	0.000	0	0	0		
SIDESHELL	MILD	11	1	0.650	0.630	0.020	3	3	0		
SIDESHELL	MILD	12	1	0.650	0.640	0.010	2	2	0		
SIDESHELL	MILD	13	1	0.820	0.800	0.020	2	2	0		
SIDESHELL	MILD	14	1	0.820	0.800	0.020	2	2	0		
SIDESHELL	MILD	15	1	0.820	0.830	-0.010	-1	-1	0		
SIDESHELL	MILD	16	1	0.820	0.820	0.000	0	0	0		
SIDESHELL	MILD	17	1	0.820	0.800	0.020	2	2	0		
SIDESHELL	MILD	18	1	0.820	0.800	0.020	2	2	0		
SIDESHELL	MILD	19	1	0.820	0.810	0.010	1	1	0		
SIDESHELL	MILD	20	1	0.820	0.820	0.000	0	0	0		
SIDESHELL	MILD	21	1	0.820	0.820	0.000	0	0	0		
SIDESHELL	MILD	22	1	0.820	0.810	0.010	1	1	0		

Figure 4: Thickness Reading Report

Andrew Kendrick

I have a few questions. I found the paper extremely interesting. Can you give us some indication of the cost of implementing the system for any given ship in the first instance? Also, what procedures are you using for getting your data input in the first place? Are these drawings being generated for you by the shipyard or is this something you're doing in-house? Finally, how do you go about getting standardization. How do you measure positions if you're using them for corrosion trend analysis?

Kirsi Tikka

First of all, the price of installation. The program in itself is fairly cheap, on the order of $20,000. The biggest cost is inputting the structural drawings into *CATSIR*. But that's a one-time cost and depending on how many ships you have in a class and how many years you're going to keep the vessels that you have the drawings for, you can divide the cost per ship and also per year. It's hard for me to give any quotes on the drafting because it varies from where you're doing it, what kind of vessel you have and so on. We have entered drawings for most of our classes, or we're in the process of doing that. We've used various contractors to do that. We've also used one of our partnership shipyards to do the drawings. Now again, who inputs the drawings depends on how much control you want to have, what the quality control program you want to have and how much you want to pay for them.

For inputting information, we've so far worked with two inspection companies that have been trained to use the program. They input the inspection information and for our U.S. vessels they also input a lot of the repair information. We also work with the shipyards that we have the partnership with and they input repair information. Does that answer your question on the procedures?

Andrew Kendrick

Almost completely. If you're using, for example, ultrasonic techniques for monitoring pipe corrosion then you normally put on some form of gauge that allows you to standardize your measurement positions. Are you trying to do anything like that with *CATSIR* or is it at the inspector's discretion to try and hit the same point?

Kirsi Tikka

It is left up to the inspectors. We usually use the same inspectors on the vessels so they know the vessels and the problems very well. At least for taking gaugings on plating, I don't think it's very practical to determine specific locations for gaugings because that way you may miss the areas that you really need to take gaugings. The practice is that they take gaugings in all the bad areas and several gaugings around it so that we know the extent of the bad areas. They also take readings in the better areas to get an idea of the average thicknesses and then of course readings required for Special Surveys. We follow a standard practice for taking readings on, for example, transverse bulkheads and stiffeners, which gives us a possibility to monitor corrosion. For piping the practice is that we scan the areas that we think might need renewal work.