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Research on Process Planning Technology of Key Components of Underwater Production Facilities

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Abstract. Due to the limitation of the manufacturing industry of our country, there is no specially Manufacturing and production base for underwater production facilities. Process planning technology is the key of building a set of complete manufacturing system of underwater production facilities. So the process planning technology of the key components of underwater production facilities is researched on the paper. And a process design system based on Creo2.0 is developed. The processing of the key components of underwater production facilities can be designed on this system.

Introduction

As the offshore oil resources are paid more attention by the national, establishing a complete set of manufacturing system of the key components of underwater production facilities is extremely urgent. Research on the process planning technology of underwater production facilities based on present situation of the manufacturing industry and the characteristics of underwater production facilities will promote the development of underwater production processing and manufacturing[1].

The production type and characteristics of key parts of underwater production facilities

The underwater production system is usually composed of oil Wells, Well oral, Christmas tree and some operating equipment, etc. Their machining processes almost cover all kinds of processing technology [2]. For example, the jaw connector is composed of jack catch, drive ring, compound lens gasket, top wall cylinder, locating device, hydraulic system and so on. Their main processing methods include turning, milling, drilling, boring, thread cutting, etc.

In addition, according to the production goal programming of the underwater production workshop, the capacity planning of the key parts of underwater production facilities is listed as Tab.1.

Tab.1 The capacity planning of the key parts of underwater production facilities

product name	annual production
6 inches installation tools	2-3 Sets/year
6 inches jaw type connector	30 Sets/year
heat exchanger	20 Sets/year
key axis of subsea tree	2-3 Sets/year

From Tab.1, it can be known that the production type of the key parts of underwater production facilities is OTS Von Lieferant.

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The establishment of process information database of the subsea production key parts

The planning of machining process formulation is a complex process which involves a large number of technological knowledge and expert experience, including the part information, processing material, work blank type, machine tool data, tool information, jig information and standard process planning data, etc.

The process information database of the subsea production key parts can be established through storing the data information which is arranged and edited in the ACCESS database.

The purpose is to provide an effective, convenient software system which is easy to master use for technologist and provide the function of query and selection for the planning of craft process the subsea production key parts.

This system can cut down the time of the process design, reduce the workload of technologist, and improve the efficiency of process design. And the information in the database can be modified, added, and deleted in the system.

Therefore process information database should be able to successfully access in the process of machining process formulation.

In this paper, ADO database access technology is used to access the information database and execute querying, modifying, deleting, adding commands. The process of accessing the database in the ADO way is shown in Fig.1.

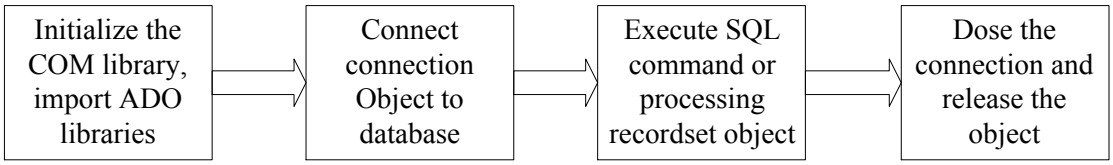

Fig.1 Process of ADO to access database

Process design platform of the key parts of underwater production facilities based on Creo2.0

The contents design of process file. The dialog of process card can be called by the menu of process card, which can be used to edit the process document. The content of process document can be edited with this dialog. In the process of editing the content, some processing information can be inquired with the submenu on the dialog, for example, the dialog of cuttingparametersquery can be called when click the menu of cuttingparameters, which can be used to query the cutting parameter in the database of process information.

The generation and displaying of processing sketch. The processing sketch is a graphics expression of process designing and it's also a technical documents to direct production as same as process chart. The workers usually can't see the drawing of the workpiece in the process of machining. So the machining content usually is described with the processing sketch. Therefore, the drawing of processing sketch is a key task of designing the process card. In this paper, the parts processing sketch is generated with the API functions of Pro/Toolkit and the function of generating processing sketch which is a function of Creo2.0.

And some basic dimension of processing sketch is marked automatically. The processing sketch will be generated with a few modifications. The process of generating processing sketch is shown in Fig.2

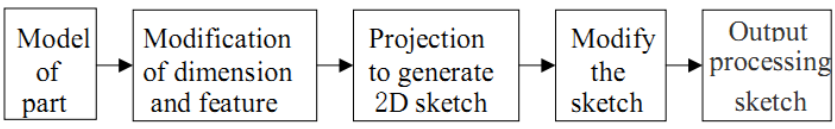

Fig. 2 Generation process of processing sketch

The display of processing sketch is divided into two parts because they need to display in processing card dialog and the excel model of processing card. The processing sketch is stored in

database in order to make it easy to manage and display. The processing sketch is displayed in the picture control of processing card dialog with the functions as follow [3]:

HOldBmp=m_GongXuTu.SetBitmap((HBITMAP)LoadImage(NULL,path,IMAGE_BITMAP,521,232,LR_LOADFROMFILE)).

In addition, the processing sketch also need to display in the EXCEL model of processing card, this will be come true with the functions as follow:

Shapes m_oShapes;

m_oShapes.AttachDispatch(sheet.GetShapes(),TRUE);

m_oShapes.AddPicture(path,false,true,5,48,763,382)

So far, the generation and display of processing card is completed as shown in Fig.3 and Fig. 4.

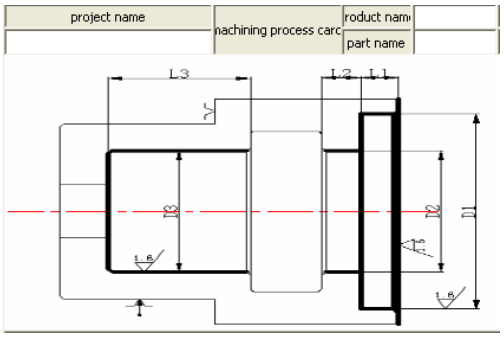

Fig.3 Display processing sketch in dialog

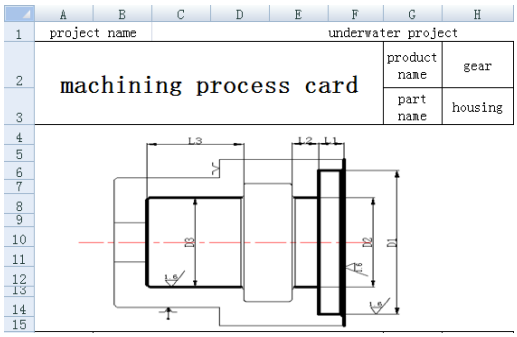

Fig.4 Display processing sketch excel

Output of processing document. The ultimate purpose of process planning system of underwater production facilities is to generate process card which is used to guide the processing of underwater production and processing. In this paper, the content of processing card is edited in the processing dialog which is developed on the software platform of Creo2.0. The information of process card dialog is exported in the customize Excel process card template in advance [4]. With the generating of excel process card, it is convenient to print and transfer. There are several ways to realize the operation of the Excel in VS2010, including the way of ODBC database operation, the way of parsing Excel spreadsheet file and the way of OLE/COM. The operation of the Excel is realized in the way of OLE/COM in this paper. And the process is shown in Fig.5.

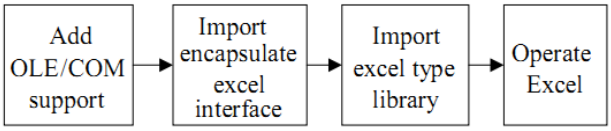

Fig. 5 The realization process in the way of OLE/COM

EXCEL format process card is shown in Fig.6.

project name		underwater project								Offshore oil engineering co., LTD.					
machining process card						product name	gear drive housing	product ID	CP0002	stability ID	JZ0001	process card NO.	GY3002501		
						part name	housing	parts ID	LJ0025	part dwg No.	TZ20010010	total three pages, the first page			
Material mark		HT250		Types of blank	casting	Blank dimension	218*142		quantity of each blank	1	quantity of each	1	Remarks		
Process of	process name	process content					Whether inspection	program	equipment	tooling	tool	Measuring tool	operator	inspector	
10	turning	Rough turning outside cylinder to size of 90 mm, Rough turning step plane					no	NC0001	CW6163/2850	Three jaw chuck	regular turning				
20	turning	Rough turning other end to 143mm, rough turning					no	NC0002	CW6163/2850	Three jaw	regular				
30	turning	Rough turning outside cylinder to required size					yes	NC0003	CW6163/2850	Three jaw chuck	regular turning	vernier scale			
40	turning	finish turning other end to required size, finish turning through-hole to required size					yes	NC0004	CW6163/2850	Three jaw chuck	regular turning				
50	drill hole	Drilling diameter to 10 mm					no	NC0005	CA6150	Three jaw chuck	drill	vernier scale			
60	milling	Jaw clamping, milling hole to required size					no	NC0006	XA6132	Three jaw chuck	drill	vernier scale			
70	surface hardening														
80	paint														
			design		proof-read		audit			process card barcode	GY3002501				
revision	change document number	version date	date	2013-11-8	date	2013-11-8	date	2013-11-8							

Fig.6 EXCEL format process card

Conclusion

In this paper, according to the characteristics of the underwater production facilities of key parts processing technology, technology information database was built based on ACCESS database, the secondary development of Creo2.0 is completed, process planning platform is designed based on Creo2.0, the editor of technology content and rapid generation of process diagram can be finished on the platform. The efficiency of the process is improved by querying process database information, and Code-128 is added to process documents for querying and managing process files.

Acknowledgments

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