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**doc. Ing. Milan Edl, Ph.D.,**
**Ing. Jan Zdebor, CSc.,**
**Ing. Roman Čermák, Ph.D.**

*University of west Bohemia*

## THE MANAGEMENT OF DATA FLOW MANUFACTURING OBJECT FOR INFORMATION SYSTEM OF INDUSTRY 4.0

One of the most closely watched indicators of long-term economic prospects is productivity. Rising productivity is the key making possible permanent increases in the standard of living. Changes in a technology are the only source of permanent increases in productivity, but a number of transient factors can affect both true and "measured" productivity. [1] The present situation in the industry is characterized as a period of intense progress of technologies at the significant computer aid in all branches of industry. In connection with the technical progress it is increasing the pressure on the manufacturers to develop and make the products as soon as possible at the minimal cost in required quality. The product has to be competitive, it has to be up to qualitative and functional standard, it has to have reasonable price, efficacious design, and it has to consider safety, ergonomic and other aspects, which decided about its marketability. That is why the system has to ensure production effectivity and quality increasing, To be its structure dynamically adaptable for actual situation and for user specific conditions with minimum negative effects. Selection in which way will be a process plan created, whether approach of group technology will be used or whether it will be done for every part separately. If the part will be manufactured using of NC (Numerical Control) machine, the producer will be able to decide how the NC program originate, whether it will be written manually or whether it will be created by means of CAM (Computer Aided Manufacturing) system; Selection of parts with the similar material and dimensional characteristics, with similar process plans; therefore, it will be considerably able to save the batch time; To be parameters processed easier and faster. To be preparatory time for a technological documentation reduced; To be information used not only for technological documentation generation, but also for details processing due to data storage, for economical needs and for wage records [2,3].

Data flow in the future, that is also considered in the newly designed information system, is based on the concept using STEP NC. It enables a product model database to serve as direct input to a CNC machine tool. No separate files of tool paths. No G or M codes. No post processors. This is a radically different approach to CNC programming. STEP NC is an extension to STEP, the STandard for the Exchange of Product model data [4]. STEP is the international standard that specifies a neutral data format for digital information about a product. STEP allows this data to be shared and exchanged among different and otherwise incompatible computer platforms. STEP NC standardizes how information about CNC machining can be added to parts represented in the STEP product model [5].

STEP NC allows a complete database of machining information to be built around the digital product model and ultimately makes it possible for this enhanced product model to serve as machine tool input. This database is structured such that part features are linked to specific "working steps," generic descriptions of various machining operations. STEP NC working steps are roughly equivalent to machining commands formatted as traditional M and G codes. With the concept of "working steps" in place, the manufacturing process becomes streamlined. Now, a machine tool can receive a file with STEP NC data, "know" what it means, and proceed milling the piece without any more instructions. There will be no more programming the machine tool for each individual piece. Moreover, with a set of standards "working steps" in place, all manufacturers will be able to share information reliably and instantaneously [6].

The objects in machine engineering such as parts, machines, equipment and other issues are possible to be modelled on various stages and with various goals. It will result in various types of models (physical, simulation, computer, mathematical and other). Every of these objects it is possible to consider as system, which consists of other features, respectively as a feature that is part of some system. To be the objects implemented inside an information system and to be possible to work with them, it is advantageous to encode every object with a code, which would express all its characteristics [7].

NC machines need the NC program for the running today. It can be written „manually “by direct writing of NC instructions, or automatically by means of postprocessor. To handle the wide variety of RS274D dialects (over 5,000), postprocessors are used to automatically convert tool path data generated by CAM to G-codes specific for CNC's RS274D dialect. In some cases, this is done by the CAM system internally, in others the CAM system generates APT "cutter location" data that is converted to G-codes by the postprocessor. Postprocessing is not a value-added step, therefore the CNC will not be needed to use Gcodes in the future. There will be no need for creating a new and separate file of tool path data. Tool paths will be figured out in the CNC itself, based on the product model. That means there's no need for postprocessors either. Data will be formatted for execution by the machine within the CNC. And because the product model won't change, it will be available for machining "hard copies" whenever and wherever needed. Postprocessors will no longer be of concern to endusers. If they exist at all they will be buried inside the control as a way to translate the working steps in a STEP-NC program into the instruction codes understood by the CNC. No one will need to see these codes except under special circumstances just like no one typically sees the assembler code of a computer anymore. [8,9].

The requirements for post processors eliminate STEP-NC, because STEP-NC has no dialects. It allows building a complete database of machining information around it. Manufacturing organizations need to be able to seamlessly share information over the Internet. Using STEP-NC, machine shops can reduce "set up" times by up to 35 % if they can seamlessly read the 3D product geometry and manufacturing instructions of their customers, and original equipment manufacturers can reduce the time they spend preparing data for their suppliers up to 75 % if they can seamlessly share the design and manufacturing data in their databases [10]. The designing new philosophy and the development of new software product for the creation of multivariant process plans is the intent of concept Industry 4.0. This approach enables to increase of effectivity already at the beginning of product design and to improve the process of technological documentation creation without of the influence on its complexity. Generated application will be built by modular manner to allow flexible adapt data structure to user specific conditions and to satisfy the specification of simple implementation into already existing information structure of the plant. The output data of the system will be able to utilize not only for the generating of technological documentation but also to the processing of details for manufacturing, store, economic and wage records, thereinafter for the creating and archiving of NC programs and for the data registration, too. It is assumed the practical verification of the final product in real conditions of manufacturing plants [11].

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**Ю.А. Буренников, к.т.н. ,проф.,**
**О.М. Мироненко, инженер**

*Винницкий национальный технический университет*

# МЕТОД ИЗГОТОВЛЕНИЯ СТАЛЬНЫХ ОБОЛОЧКОВЫХ ФОРМ ИЗ ЛИСТОВОЙ ЗАГОТОВКИ (3D ВЫТЯЖКА)

В металлообработке распространены различные методы изготовления оболочковых деталей. Самые известные из них – это ковка, штамповка, литье, сварка и механообработка. На выбор оптимального метода влияют такие параметры, как тип детали, ее размер и назначение. Каждый из перечисленных методов изготовления деталей имеет свои особенности, обладает определенными преимуществами и недостатками. Сравним самые распространенные из них.

Литейная обработка – один из наиболее распространенных методов изготовления деталей. Данный метод требует изготовления формы, которую затем заполняют расплавленным металлом. Возможности этого метода несколько ограничены, стоимостью оснастки, для изготовления точных деталей, высокой разностенностью изделий, неоднородностью структуры металла, невозможностью изготовления тонкостенных