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Requirement of New, Effective Educational Programs – Necessity for Future Development of Society

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Abstract

The article analyses demands of new concepts of student education on the level of secondary schools with technical focus. It urges the necessity to create new educational programs that prepare new future technical operators towards requirements of the labour market in future years in harmony with specifications of Industry 4.0. Many of job specializations is possible, at present time, to estimate only as a frame, but considering a length of study it is necessary to realize predictions at sphere of education needs consistently, expertly and continuously to introduce their results into innovations of existing educational programs or to introduce completely new, perspective educational programs by needs rising at production sector.

Keywords: education, CNC machine, software, complexity

Introduction

There are enacted some significant events at present:

- Formation of following phase of industrial revolution – Industry 4.0,
- Change of demographic structure of population – aging of population,
- Constraints implicit from health protection of population by effect of Covid 19,
- Emulation of big economic subjects: USA, Europe Union, China.

All upper mentioned events, but also another as: migration waves and wildly developed countries with large numbers of inhabitants (for example India, Brazil) generate assumptions towards changes in economy at the Central Europe territory moreover. Standard request is high quality, effective, rational and smart production including ecology requirements also. These significant demands call for

a continuously rising automation of the production process from the point of view of decreasing manpower at production.

Requirement of education change

Upper mentioned matters of facts create an assumption of necessity of continuous manpower quality preparation increasing. At present, it is probably not optimal to separate professions to purely machine, electrical and so on. Future apparently belongs to diffusion of different professions into specializations with different particular specialization abundance ratios so that resultant knowledge enables to perform required activity. This implies for example – manufacturing employees would be able to design patterns of machine components and consequently to produce it by entering specification. Employee needs for such activity knowledge about:

- Software that enable design of component
- Labelling of component by actual norm
- Technological proceeding of production in term of how to achieve required qualitative parameters
- Creation of software for CNC machine control, that produce component from particular material
- Achievement of effectiveness by economical aspect
- Ecology requirements compliance in term of health protection during production process
- Possibilities of material used at production process liquidation – produced products have to be designed since start by all aspects in terms of possibility to recycle them and to minimize influence to the environment.

It is not simple to join all aspects, not only mentioned. Profile of various educational specializations is necessary thoroughly to reconsider, theoretical aspect and hands-on training moreover, for secondary school level. Though, relatively small mistakes in terms of unconsidered development of education, can originate big complications in future. Considering terms of secondary study 4 years and preparation of educational program 1 year means – accomplishment of new education program will be manifested approximately after 4–5 years. Production process is not static, it is dynamically developing. Because of that, it is necessary to prepare and to introduce new educational programs corresponding to future requirements of the future without delay – as it is popularly told: it was late in the day yesterday.

Development of documentation – design of component

We can assume that employees should produce components – the example is in Figure 1. Future employees (students now) have to learn how to do design and whole preparation of component production at school. Whole process of compo-

ment preparation consists of many actions mentioned above (amount of actions is in real practice many more). Detailed specification of the final product is the first act. On the basis of product specification is a realised scheme by technical norms. At present, schemes are not realised manually, but correspondent software is used. The category of software that makes it possible to create 3D schemes is used. According to it, a student has to be acquainted with this software, with its potentialities and servicing technique in detail at school. It is not a simple job as indicate panel of instruments only of the introducing display shown in Figure 2.

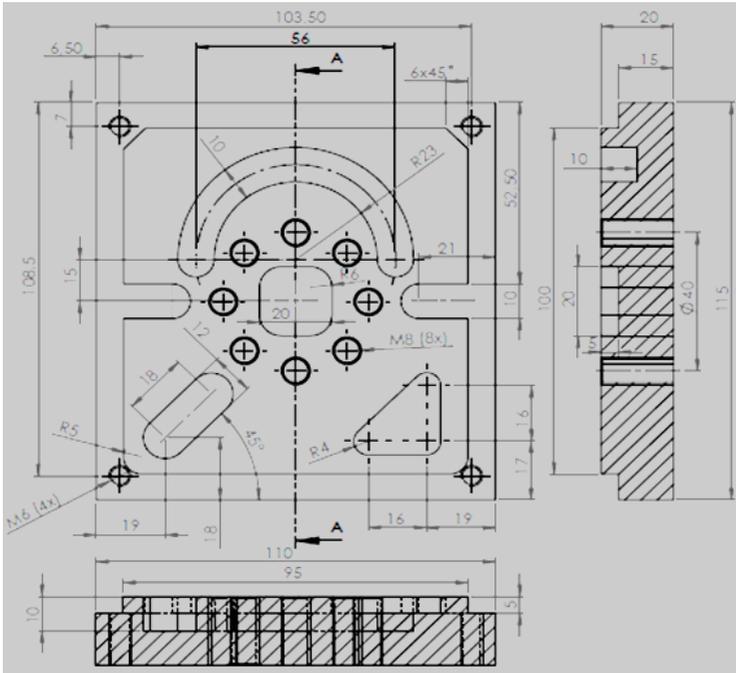


Figure 1. Designed component

A quantity of alternatives on panel of instruments and screens related to alternatives and next screens displayed consequently, with additional possibilities of separate activities, is large and a student (future employee) has to be able to use them effectively.

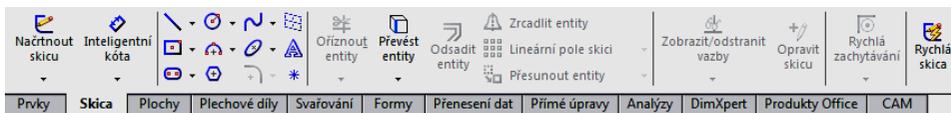


Figure 2. Panel of instruments – basic alternatives

Separate screens that enter in sequence into different depths – consequently subsequent and subsequent screens are shown into one primary option. An employee has to have the idea about software structure – not to “get lost” into software or uselessly look for the instrument needed for creation of the required part of the scheme. A scheme of created components will be displayed in sequence in 2D presentation (Figure 3) in the desktop of used software. After finishing the whole scheme, including needed 3D design, it is necessary to dimension all parameters (as it is shown in Figure 1) by actual norms – to give all information to everyone. When all documentation is complete in complex proportion, then has to be defined: corresponding material for component production, mode of machine work, the type of machine suitable for production and instruments necessary for particular working operations. CNC machines controlled by a computer are used at present. CNC machines are complex technical machines working with high speed and precise, that means CNC machines have considerable price.

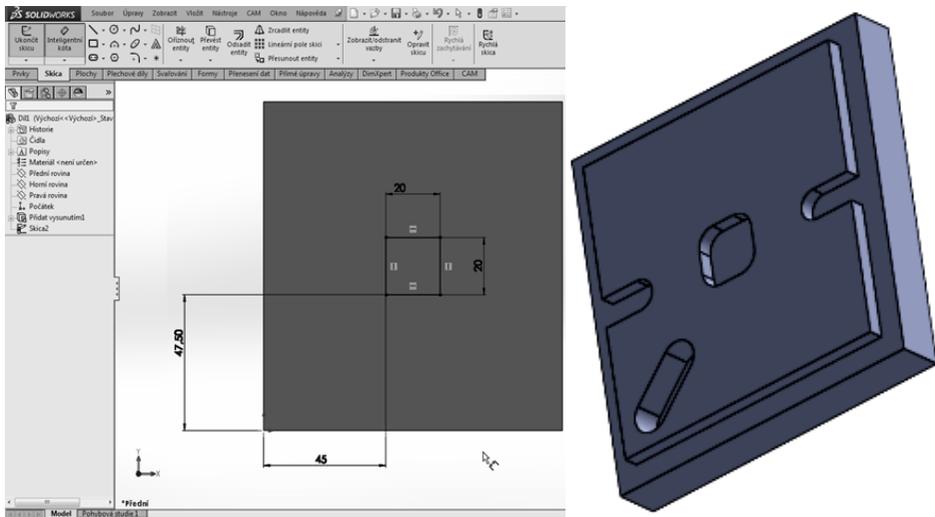


Figure 3. 2D and 3D schemes of component

Because of upper mentioned reasons, an employee has to be in detail acquainted with operation of the CNC machine, so as to prevent extensive damages on machine, used materials, health of employees or environment when operation by employee is unsuitable. The CNC machine is prepared by the employee for the production process – an integral part of this process is: selection of suitable tools, inserting tools parameters into software of the CNC machine, physical inserting of tools into relevant container of tools in specific CNC machine, etc. (Figure 4).

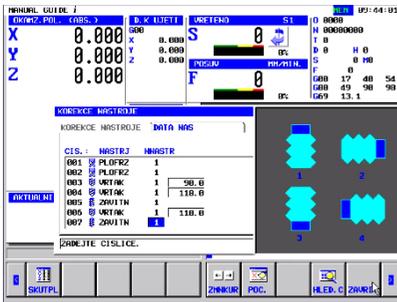


Figure 4. Tools and their parameters inserting into software of CNC machine

A hardware of CNC machine without needed software that will control its actions, do not do anything. It is necessary to make a program for CNC machine – that is following creative activity (Figure 5).

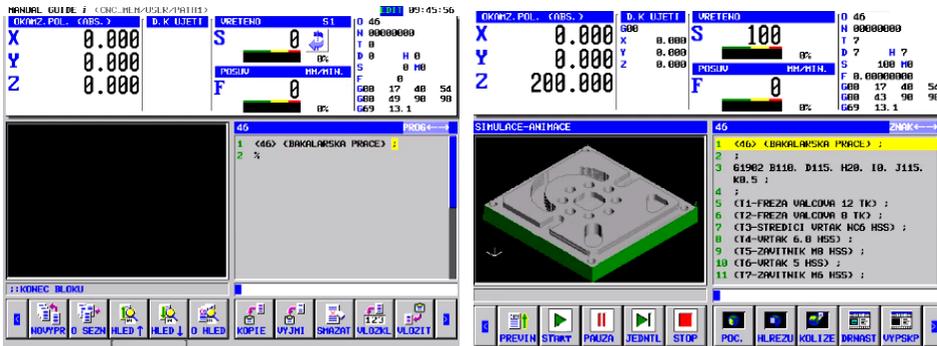


Figure 5. Control of CNC machine is realised by specialized software

An advantage of actual specialized software for CNC machines control is the offer of many functions that make easier creation of software, including presentation of what the machine will do based on separate instructions. An employee has immediate supervision over instructions that he insert into the program for machine control. Quantity of needed operations for different machining of components is very large – possibilities of software are suited to it. A student has to learn particular software that is another serious and long-time activity. Simplification of this educational activity markedly supports qualified theoretical and practical activity of an educator. Good knowledge is not possible without the activity of a student – a student has to have possibility to work with the software practically, because still is valid: you learn the most by the activity that you do personally practically on the base of high quality theoretical preparation (Figure 5).

Complex study about CNC machine control

There was mentioned the sequence of professional activities joining each other, but we do not mention the self CNC machine – we have done preparation steps before the production process yet. Each CNC machine contains a control panel that operates an employee most frequently. Examples in Figure 6 illustrate relatively considerable complexity of machine control. A student has to learn this machine under command of a competent teacher. A student – employee has to control the machine for fair at different regimes of its operating.



Figure 6. Examples of control panels of CNC machines

At present, a lot of programs for different regimes of machine control are prepared by simulation software except the real machine (Figure 7).

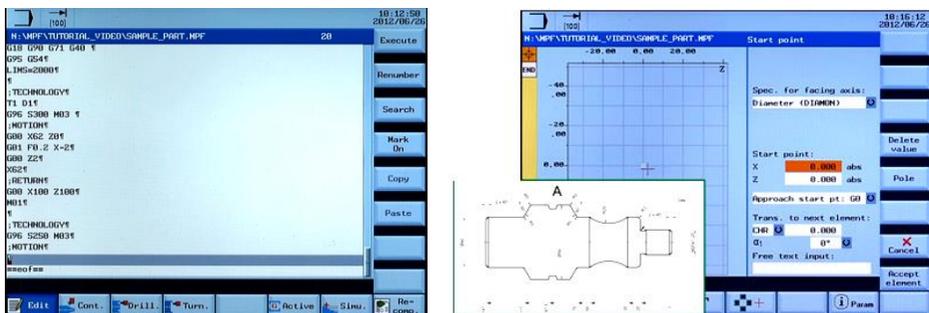


Figure 7. Examples of simulation programs using

Working time of a real CNC machine is saved this way (expensive real CNC machine is not blocked by preparation of the program). Simulation program prevents potential accidents at the process of control program preparation.

A program can be divided into separate parts that are programmed by a team of programmers. There can start evaluation of the program – by separate subprograms linking together into a complex program and by transferring the program to a real CNC machine. At this process, different separate operations can be reprogrammed or supplemented according to objective realization of component machining by CNC machine. An CNC machine can save many programs into its memory and an employee has to be able to find out and to apply relevant programs. Innovations and software upgrading by different aspects are very frequent – for example: an effectiveness of machining increasing, a quality of component machining increasing, a wear of tools decreasing, etc. For all that, an employee has to be able to replace the original program with new, more powerful programs. By upper mentioned, some cardinal activities illustrate the seriousness of student preparation for their future professions – machining of materials by modern machines.

Conclusion

The article describes some activities that future employees have to know at a process of component machining. The article, by that activities example, points out the requirement of a new approach to content and methods of student education for the field of industry production. The competent representatives of manufacturers have to cooperate on development of education – they have to formulate specifications to education for future employees with perspective at least 10 years. These specifications have to competent workers in the field of education to transform into study programs – so as school-leavers had needed theoretical knowledge and practical high-tech abilities and were able to develop them during the production process.

Literature

<https://www.cncknihy.sk/> (25.05.2020).

<https://www.youtube.com/watch?v=ubzAqA6bOtc> (28.05.2020).