ASPECTS RELATED TO MANAGEMENT AND SUPERVISION OF TECHNOLOGICAL PROCESSES OF MACHINING

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Abstract: *At the moment, the methods and systems of manufacturing are changing: new technologies of processing appear, technological flows have a minimal number of phases, the flexibility of the technology increases, methods and tools of managing and monitoring the operations of processing appear. This work presents a way of management and surveillance of the technological process of machining of a blowout preventer body using technological circuit planning using software named Microsoft Project.*

Keywords: *blowout preventer body, technological circuit, planning, Microsoft Project*

1. General principles

The components of the technological process of machining are: the operation, the placement/the position, the phase, the passing, the handling and the movement "[Amza, 2001]".

It appears that this model is an orderly meeting at different levels (operation, placement, phase, etc.) of the elements that contribute to transform the blank to get the final product "[Nae, 2003]". The model provides the image of vector summation goals on each element of the structure.

In these circumstances, the technological process of machining can be assimilated to a project proceeds in a logical order, keeping temporal correlations between the activities, employment in a certain budget, involving material and human resources.

The similarity that exists between technological circuit of machining of a part and the project plan (Figure 1) was the basic idea for using Microsoft Project software.

2. The realization of working model

During the technological processes of machining, structural elements of the system are conditioned by generating surfaces on machine-tools: changing the shape, the size, the relative positions, the appearance of areas that compose the piece being processed.

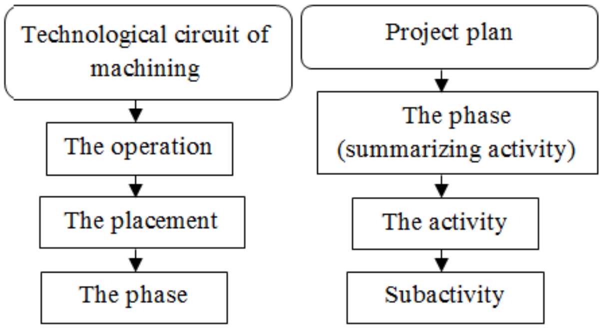


Figure 1: *The similarity between technological circuit and project plan.*

In this context, there are established the interdependencies between the surfaces that are processed, obtaining possible variants of work based on graph theory "[Nae, 2005]". Establishing the types of processing operations depends mainly on the shape and dimensions of the part or the blank and the type of the machine tool used. When designing a complex technological process (part with several surfaces related between them by dimensions and machining in several stages of work), the determination of the sequence of operations, the settlements and phases of processing becomes a laborious problem, which is solved by methods of operational research - graph theory.

To remove the difficulties in exploring graphs, which means consultation (visit) peaks or edges of the respectively graph, in this work we use Microsoft Project software which is dedicated to the design activity, tracking and optimization projects of any type "[Nae, 2006]" (construction, engineering, designing new products, etc.).

The blowout preventer body is a very important machine part in the prevention of outbreaks, it's a part of the equipment to prevent outbreaks of wellhead, because its damage causes serious accidents and the loss of the drill.

From the point of view of the technological process of machining of the blowout preventer body appear the following aspects:

- the surfaces that are processed by outside revolution surfaces;
- the inside revolution surface requires a complex technology because the bores have large diameters (between 880 … 335 mm);
- the overall dimensions (length about 1400 mm, diameter about 1200 mm) require a special material basis for developing the technological process of machining;
- the methods and means of control are universal ones, but require specialized devices due to their large size;
- the machining operations cover a wide range, starting from the roughing to finishing correction;
- the determination of the sequence of operations, settlements and phases taking place in a logic order and involving the hierarchy in an arborescent structure with a specified time (starting and ending date of the phase) constituted the necessary support to lead the process of machining helped by Microsoft Project.

3. The proposed method for the management and oversight processes of machining

To determine how Microsoft Project can be used in the management, monitoring and optimization of technological process of machining, it will present the classic stages of development of technological circuit for machining of the blowout preventer body, illustrating in each stage the characteristics of the program.

1. The identification and numbering of the processed surfaces (Figure 2).
2. The determination of the sequence of operations, settlements and phases (the design of technological circuit) is performed depending on the type of the chosen blank, on the volume of production, on money and on latest machining operation which is running for each area of the studied component.

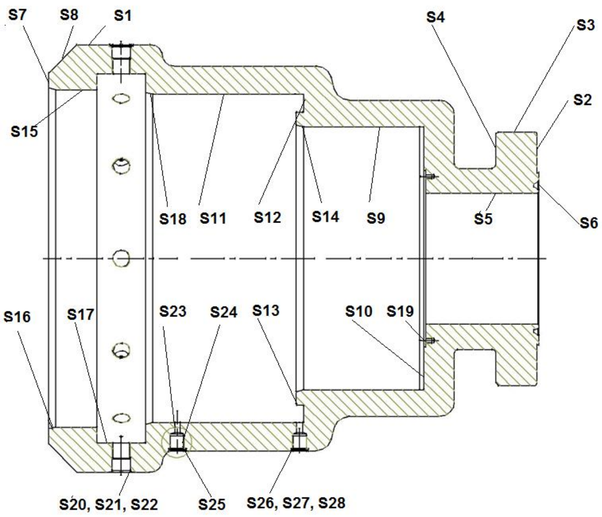


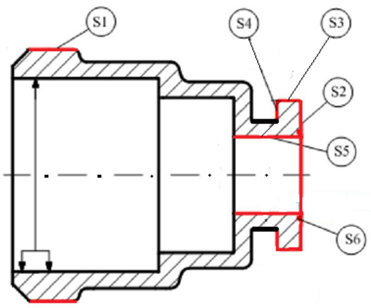
Figure 2: *The identification of the processed surfaces*.

For the technological circuit designing is representing, in Table 1, a part of the sequence of operations, settlements and phases and are conventionally denoted [Nae, 2006].

Using Microsoft Project software, we can introduce a lot of information "[Lambrescu, 2004]": the duration of the activity, start date and end date of the activity, the predecessors, the operators who perform the work (Figure 3). This information is then used to calculate the technical standard time for the machining and machining cost calculation etc.

From the information presented in the worksheet shown in Figure 2, it was customized a worksheet in Microsoft Project (Figure 3).

Table 1: *The determination of the sequence of operations, settlements and phases.*

The operation	The placement /the position	The phase	The phase name	The settlement sketch
I. Turning roughing	A	1 2 3 4 5 6	External cylindrical turning S1 Facing S2 External cylindrical turning S3 Facing S4 Internal cylindrical turning S5 Packing groove turning S6	

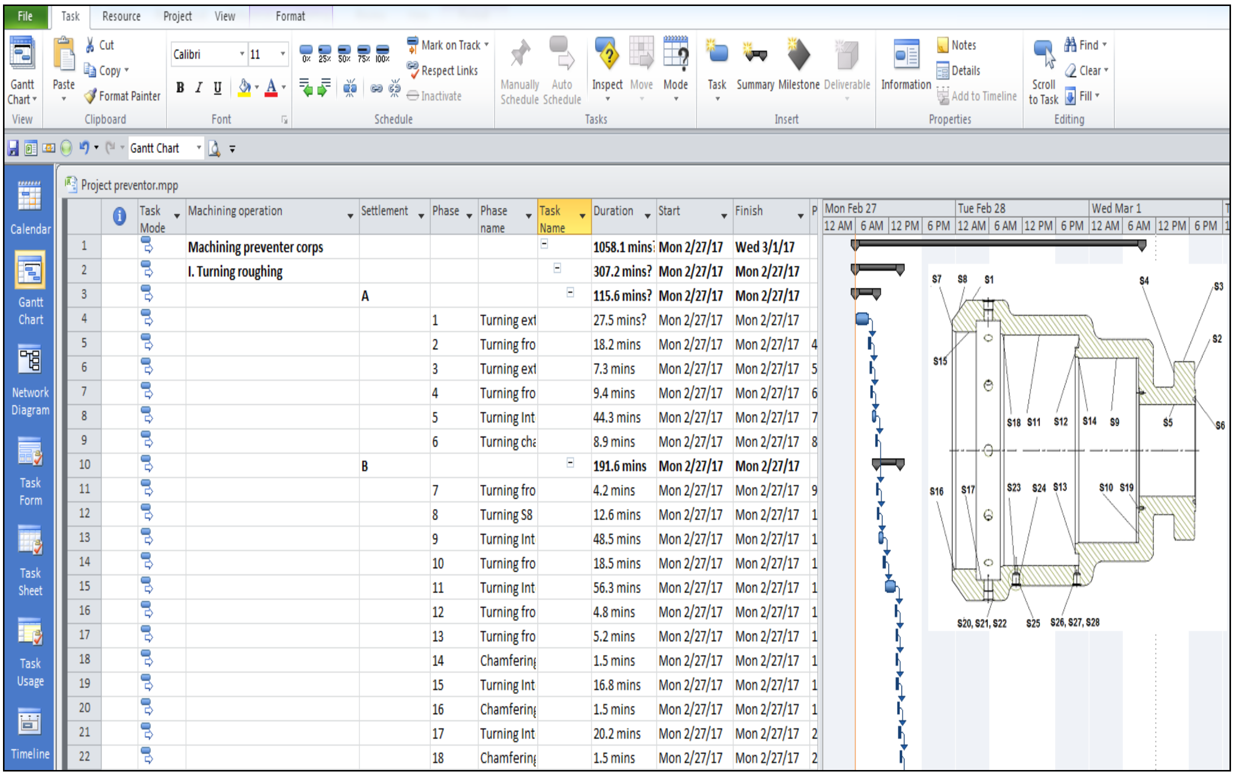


Figure 3: *The determination of the sequence of operations, settlements and phases – custom table.*

3. Estimating the durations of activities is realized using specific machining performed operations. The duration of an activity is the period of time estimated to complete that activity.

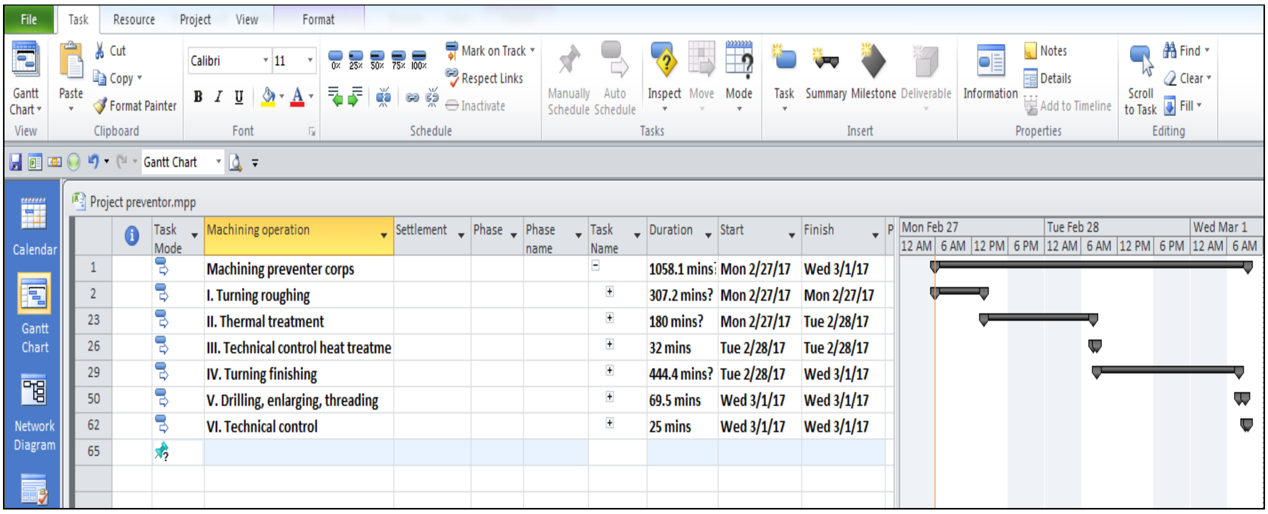
4. The establishment of relations of temporal relation between activities. The technological process of machining requires the work to be performed in a specific order, well-defined order "[Nae, 2006]". The activities of the technological process can be linked together in series, parallel, or mixed. It is a problem of analysis extremely important and how it is approached and resolved depends on the deployment technological process. The links between activities are determined by introducing predecessors (Figure 3).

If the process shows a large number of activities (operations) it is helpful to be organized in phases or groups of closely related activities. In Microsoft Project, the phases are represented by centralizing activities (Figure 4 – the representation by black bars).

5. The allocation of resources to activities. In Microsoft Project, entering the information about resources is necessary to establish the time taken for the implementation and cost of operation (Figure 5).

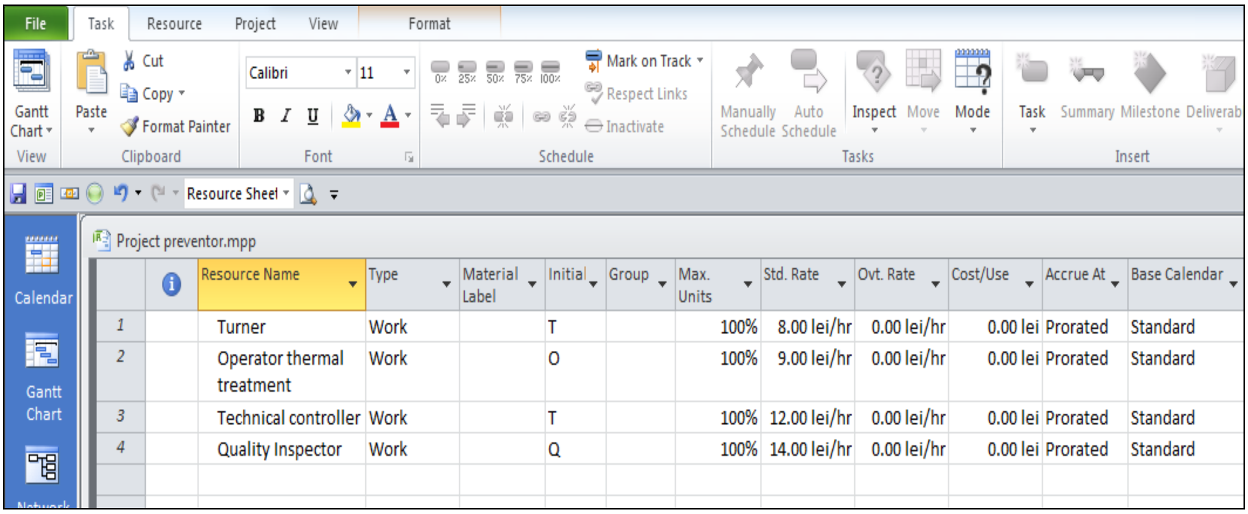
6. Scheduling of work for each resource (Figure 6).

7. Viewing loading resources (Figure 7).



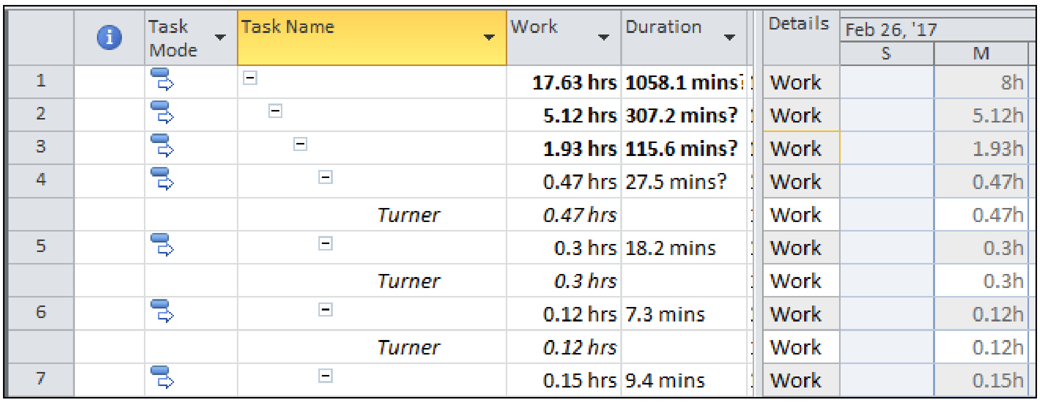
ID	Machining operation	Duration	Start	Finish
1	Machining preventer corps	1058.1 mins	Mon 2/27/17	Wed 3/1/17
2	I. Turning roughing	307.2 mins?	Mon 2/27/17	Mon 2/27/17
23	II. Thermal treatment	180 mins?	Mon 2/27/17	Tue 2/28/17
26	III. Technical control heat treatme	32 mins	Tue 2/28/17	Tue 2/28/17
29	IV. Turning finishing	444.4 mins?	Tue 2/28/17	Wed 3/1/17
50	V. Drilling, enlarging, threading	69.5 mins	Wed 3/1/17	Wed 3/1/17
62	VI. Technical control	25 mins	Wed 3/1/17	Wed 3/1/17
65				

Figure 4: *Viewing centralizing activities*.



	Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar
1	Turner	Work		T		100%	8.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard
2	Operator thermal treatment	Work		O		100%	9.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard
3	Technical controller	Work		T		100%	12.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard
4	Quality Inspector	Work		Q		100%	14.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard

Figure 5: *Establishing the necessary resources activities.*



	Task Name	Work	Duration	Details	Feb 26, '17 S	M
1		17.63 hrs	1058.1 mins	Work		8h
2		5.12 hrs	307.2 mins?	Work		5.12h
3		1.93 hrs	115.6 mins?	Work		1.93h
4		0.47 hrs	27.5 mins?	Work		0.47h
	Turner	*0.47 hrs*		Work		0.47h
5		0.3 hrs	18.2 mins	Work		0.3h
	Turner	*0.3 hrs*		Work		0.3h
6		0.12 hrs	7.3 mins	Work		0.12h
	Turner	*0.12 hrs*		Work		0.12h
7		0.15 hrs	9.4 mins	Work		0.15h

Figure 6: *Scheduling of work for each resource*.

8. The determination of the technical standard time of the process (but also operations and settlements) – Figure 8.

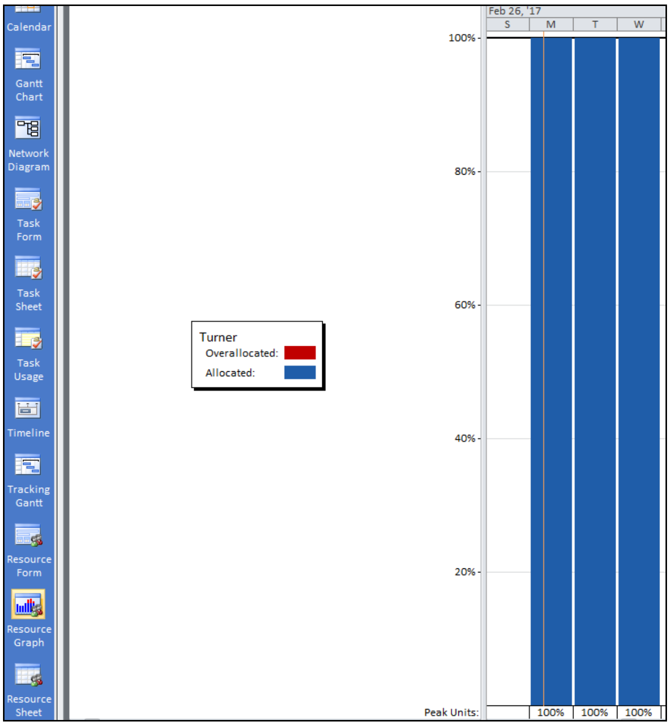


Figure 7: *Viewing loading resources.*

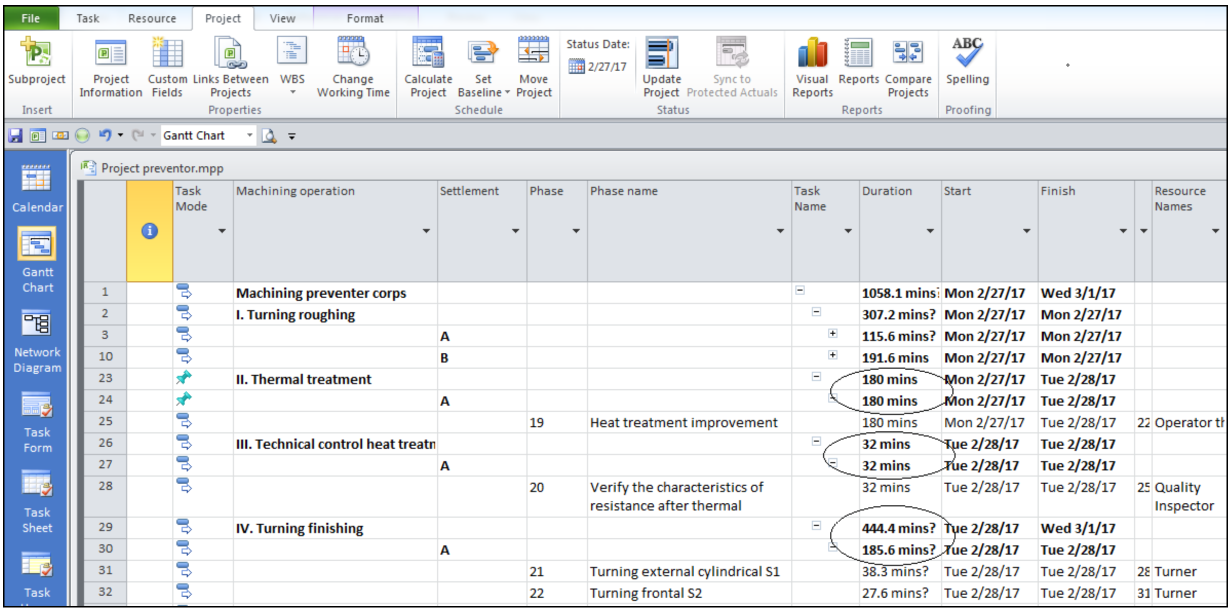


Figure 8: *The determination of the technical standard time on operations and settlements.*

9. The time length determination of the process and also technological process cost calculation – Figure 9.

4. Conclusions

The work has practical application in manufacturing processes in order to coordinate work flow and minimize working time.

The usefulness of the proposed method is justified by:

- systemic approach of machining works which allows removal idle hours;
- the composition of working models that can quickly change using computer system;
- fast adaptation to changes that occur in machining cycle (changing working time, replacement of resources, the specification of the interruptions of works etc.);

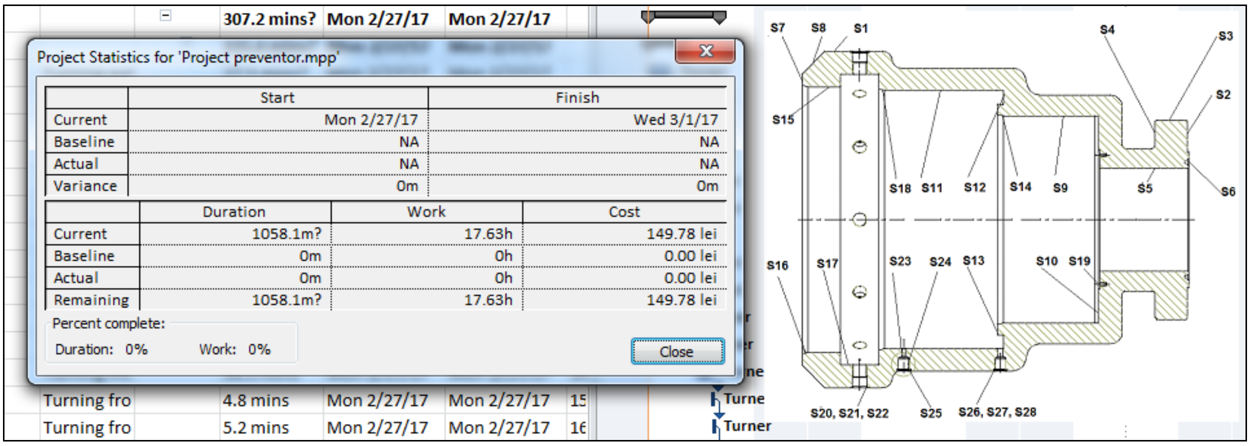


Figure 9: *The time length determination of the process and also technological process cost calculation*

- the realization of templates for working on phases of work;
- permanent registration of works that are made;
- quickly control of the working stages, highlighting the activities that are not within the specified parameters;
- quickly analysis of used resources and afferent costs.

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