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Aspects of the Mounting Problems in the Construction Works

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Abstract

Technological process of assembly is part of the production process by which finished parts are grouped in a logical sequence, in parts, assemblies and units.
In these conditions, the paper presents an analysis of the technological process of mounting a speed reducer, using the product Microsoft Project information.

Key words: *assembly, lots of parts, geared, logical sequence assembly.*

Requirements, Criteria, Objectives

Manufacturing process is part of the production process components during which all transformations are performed material changes in a logical sequence, gradually, in order to obtain a product.

Manufacturing process of mounting assembly presents the ultimate objective (group) finished parts in a logical sequence, in parts, assemblies and units to meet the requirements prescribed by normative quality (fig. 1) [1].

The project also represents a set of new activities, joint specific, structured methods that aim to achieve an objective specified in a period of time with a limited budget.

In general, the project is presented as a plan of action (fig. 2) [3].

All activities are included in the project plan is presented as a hierarchical structure, tree, highlighting the position of activities within their wider groups.

Thus, similarity provided by the two models presented (fig. 1 and fig. 2), the paper analyzes the process of mounting a speed reducer.

Working Model Developed

For installation works that apply speed gear was used tree decomposition component activities. This method allows hierarchical approach to structure the activities needed to conduct the temporal ordering of assembly work. The basic components of an activity are:

- description / name of activity, namely the establishment of its code;
- determining the duration of activity (minutes, hours, days, weeks, months etc.);
- determining resources (human, material, equipment) involved;

- determining the associated costs.

Of the existing planning techniques in project management to use Gantt chart or graph type bar which is based on Microsoft Project product information.

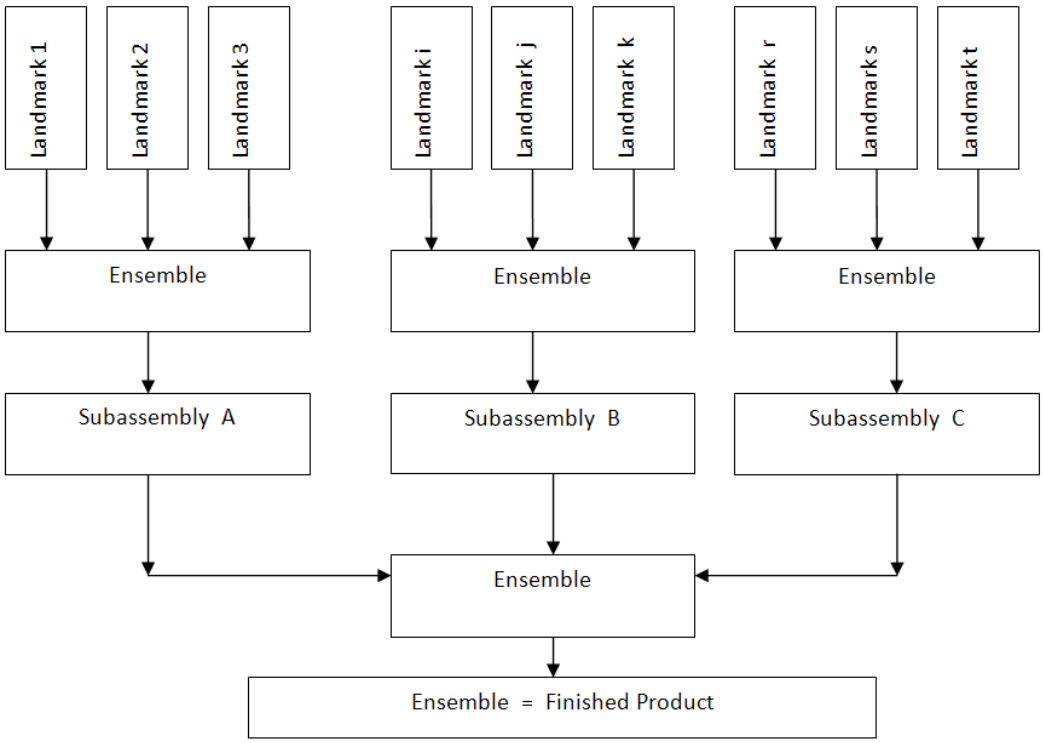


Fig. 1. The structure of the technological process of assembly

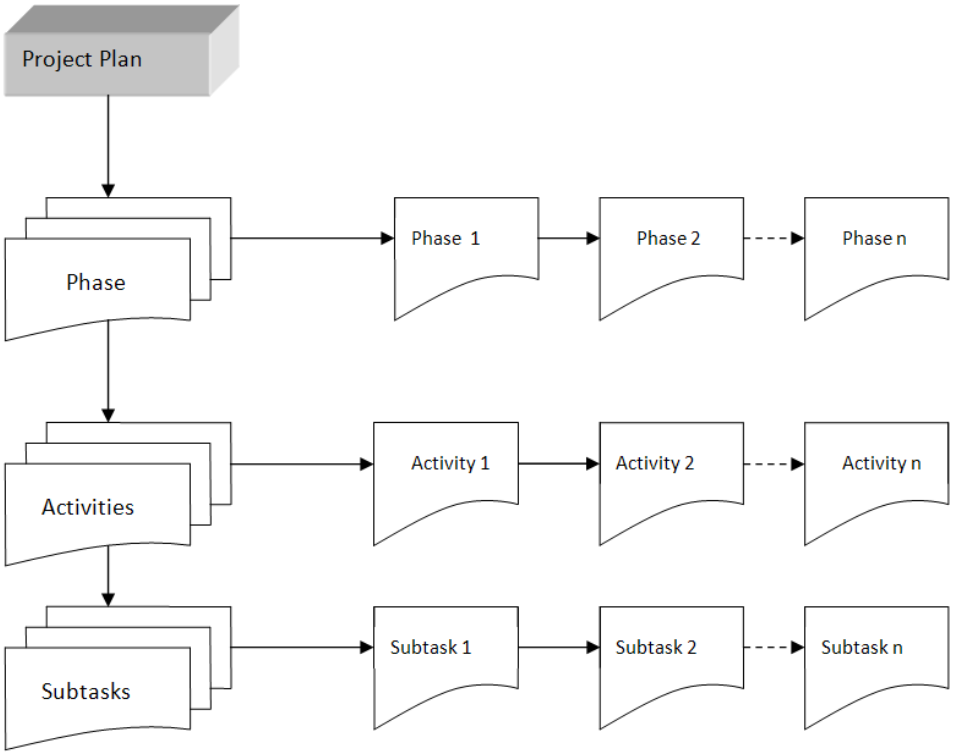


Fig. 2. Project plan

Developing the working model for assembly work gear speed which apply in the construction includes the following steps [2]:

- identify the type of construction of speed gearbox (with one step, two steps, three steps etc. – see fig. 3);
- setting assembly works nomenclature (Table 1);
- determining typical processes (assembly of the modules), establish the necessary resources (human, material, equipment etc. - Table 2);
- establishing the methodology of calculation of technical rules for the installation, the costs of mounting works;
- setting up additional work related operations (adjustments, rework etc.).

Use of Microsoft Project as a method of information management and monitoring of technological process of assembly speed gear allows:

- establishing the work plan for installation (assembly works nomenclature) establishing the duration of activities;
- establishing correlations between the activities carried out (entry predecessors);
- determining the duration of the works of mounting modules (activity summary);
- determining the total length of the technological process of assembly - Gantt chart view, establish critical path;
- establishing the necessary resources works assembling resources to activities, resource loading view, calculating the cost of installation of the technological process;
- corrected by changing resource loads overlapping timeframes manual tasks, allocation levels and availability of resources.

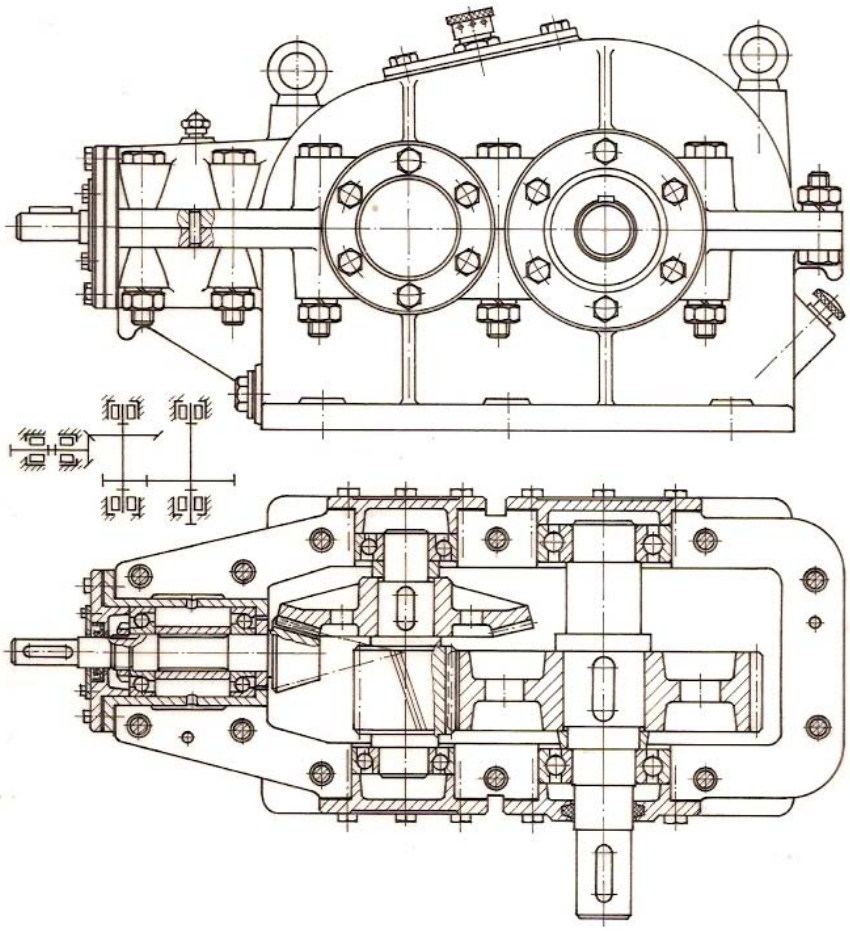


Fig. 3. Geared in two steps

Table 1. Establishing nomenclature assembly works.

Crt. No.	Activity Code	Code subtasks	Name of activity	Duration *t* (min)
1.	A	I Mounting shaft (input shaft)		52
2.		A.1.	Thrust bearing assembly in the box	10
3.		A.2.	Mounting spacer ring in box	3
4.		A.3.	Angular bearing assembly in the box	12
5.		A.4.	Conical shaft assembly	15
6.		A.5.	Mounting nut crenellated	4
7.		A.6.	Mounting gasket is tan jar is in the front cover	3
8.		A.7.	Mounting the front cover	5
9.	B	Mounting shaft II (intermediate shaft)		35
10.		B.l.	Longitudinal wedge assembly into place the tree	4
11.		B.2.	Bevel wheel assembly	8
12.		B.3.	Mounting spacer ring	3
13.		B.4.	Bearing assembly I	10
14.		B.5.	Bearing Assembly II	10
15.	C	Assembly tree III (output shaft)		35
16.		C.l.	Longitudinal wedge assembly into place the tree	4
17.		C.2.	Cylindrical driven gear assembly	8
18.		C.3.	Mounting spacer ring	3
19.		C.4.	Bearing assembly I	10
20.		C.5.	Bearing Assembly II	10
21.	D	I in body positioning shaft housing assembly		18
22.	F	II in body positioning shaft housing assembly		20
23.	G	III in body positioning shaft housing assembly		25
24.	H	Positioning the lid over the body-shell case		15
25.	I	Screws tightening grip body-cover case		10
26.	J	Mounting shaft front covers I		12
27.	K	II covers front shaft assembly		12
28.	L	III covers the front shaft assembly		12
29.	M	Mounting lid Enterprise		15
30.	N	Raising the cover mounting screws Enterprise		8
31.	0	Installation of vent plugs		5
32.	P	Mounting screws lifting		5
33.	R	Dipstick assembly		11
34.	S	Verification oil level		3

Table 2. Resources

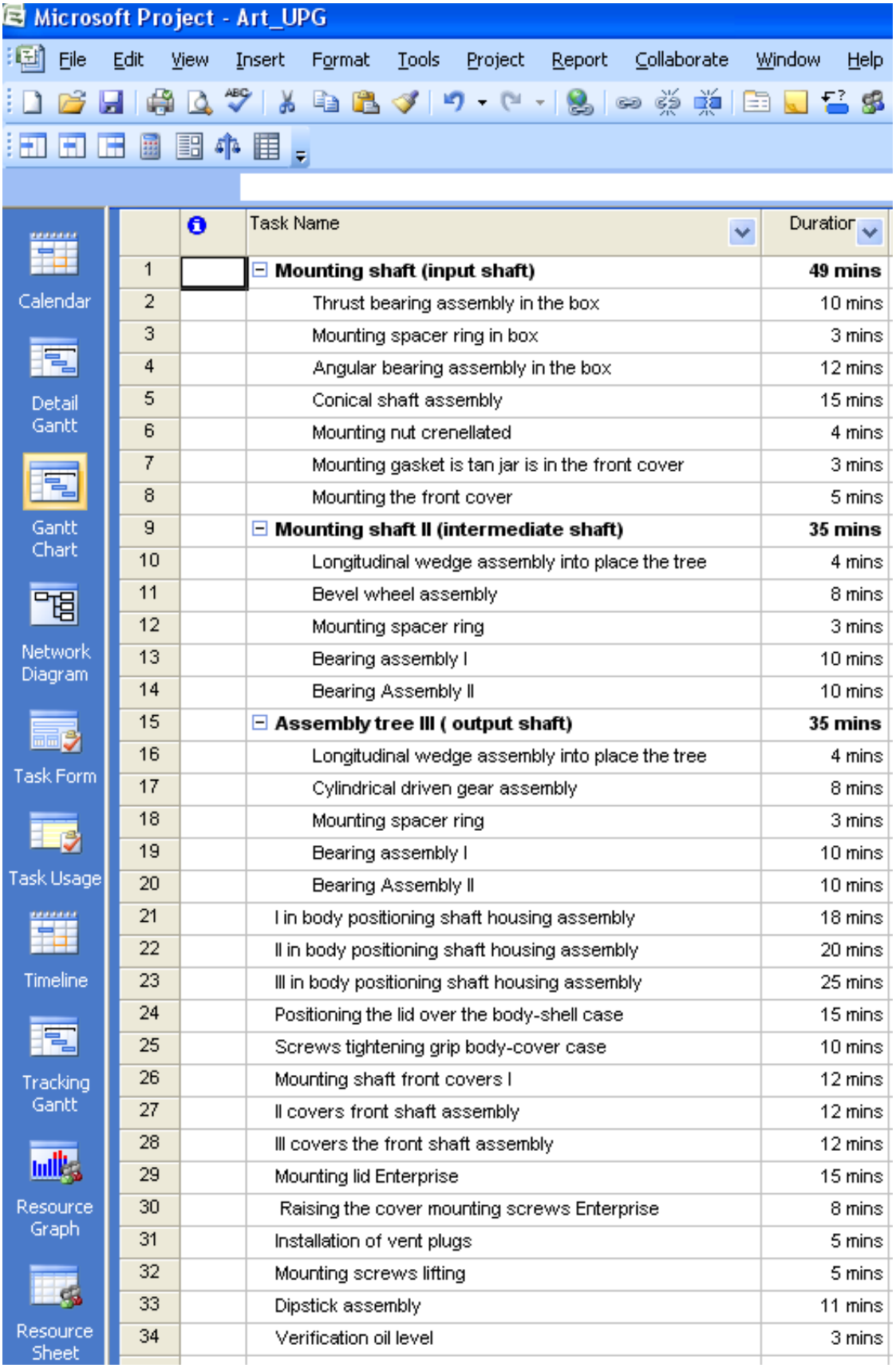
ID	Resource name	Type	Group	Max. Units	Standard Rate	Accrue At
1.	Team leader	work	technical	100%	15 lei / h	prorated
2.	Mechanical locksmith	work	technical	100%	151ei / h	prorated
3.	Locksmith fitter	work	technical	100%	15 lei / h	prorated
4.	A mechanical operator	work	technical	100%	10 lei / h	prorated
5.	Operator Mechanical 2	work	technical	100%	8 1ei / h	prorated
6.	Mechanical Operator 3	work	technical	100%	5 lei / h	prorated
7.	Mechanical Operator 4	work	technical	100%	7 1ei / h	prorated
8.	Operator mechanic 5	work	technical	100%	7 lei / h	prorated

Method of Installation of a Technological Process Geared

In order to determine how Microsoft Project can be used in the management, tracking optimization of technological process of assembly, following are the stages of work.

1. Establishing nomenclature assembly works. According to data presented in Table 1, the process of assembly is structured in three phase's summary (Fig. 4).
2. The introduction of time needed to perform assembly work (Fig. 4). To measure the working method were used to direct supervision countdown and assembly works. The results are presented in Table 1.
3. Establishing correlations between works (activities) that deployment time in the process of assembly technology. In the technological process of assembly activities succeed in a certain order, some are pampered hatred series - an activity can not be started until the other has not been completed, others are pampered hatred in parallel - that is the same time (that may overlap completely or partially - for example the supply of raw materials and materials § assembly work). For a complex technological process, the complete set of activities necessary to fulfill its activities will include a combination of serial and parallel §, forming a network that can be represented graphically - figure 5.
4. Determination of total project duration (fig. 6). All the works (activities) assembly linked by logical chronological relationships form a network (a chart / graph or a graph network). Determine the total length of the technological process is shown in figure 6.
5. Establishing the critical path of activities for the reserves who are not on the critical path - fig. 7. The critical path is the sequence of activities that form an uninterrupted (continuous path) between the beginning and end of the technological process. He is way longer eel (the length) of the entire process. Any delay on critical path activities will automatically lead to a delay of the technological process.
6. Establishing the necessary resources. In Microsoft Project, entering information about resources (fig. 8) requires the establishment and operation execution time spent on the cost.
7. Allocating resources to activities (fig. 9). How it is managed during a resource allocation over the program is called allocation and can be:
   - sub-assignment: maximum capacity of resource allocation resource is busy;
   - allocation entirely: the maximum capacity of resource allocation is occupied;
   - over-allocation: The maximum capacity is exceeded resource allocation.

   In Microsoft Project resource capacity to work is measured in units. Units are measured both in numbers (eg 3 units), and percentage (eg 300% units).



	Task Name	Duration
1	**Mounting shaft (input shaft)**	**49 mins**
2	Thrust bearing assembly in the box	10 mins
3	Mounting spacer ring in box	3 mins
4	Angular bearing assembly in the box	12 mins
5	Conical shaft assembly	15 mins
6	Mounting nut crenellated	4 mins
7	Mounting gasket is tan jar is in the front cover	3 mins
8	Mounting the front cover	5 mins
9	**Mounting shaft II (intermediate shaft)**	**35 mins**
10	Longitudinal wedge assembly into place the tree	4 mins
11	Bevel wheel assembly	8 mins
12	Mounting spacer ring	3 mins
13	Bearing assembly I	10 mins
14	Bearing Assembly II	10 mins
15	**Assembly tree III (output shaft)**	**35 mins**
16	Longitudinal wedge assembly into place the tree	4 mins
17	Cylindrical driven gear assembly	8 mins
18	Mounting spacer ring	3 mins
19	Bearing assembly I	10 mins
20	Bearing Assembly II	10 mins
21	I in body positioning shaft housing assembly	18 mins
22	II in body positioning shaft housing assembly	20 mins
23	III in body positioning shaft housing assembly	25 mins
24	Positioning the lid over the body-shell case	15 mins
25	Screws tightening grip body-cover case	10 mins
26	Mounting shaft front covers I	12 mins
27	II covers front shaft assembly	12 mins
28	III covers the front shaft assembly	12 mins
29	Mounting lid Enterprise	15 mins
30	Raising the cover mounting screws Enterprise	8 mins
31	Installation of vent plugs	5 mins
32	Mounting screws lifting	5 mins
33	Dipstick assembly	11 mins
34	Verification oil level	3 mins

Fig. 4. Structuring the technological process of mounting steps and phases of work

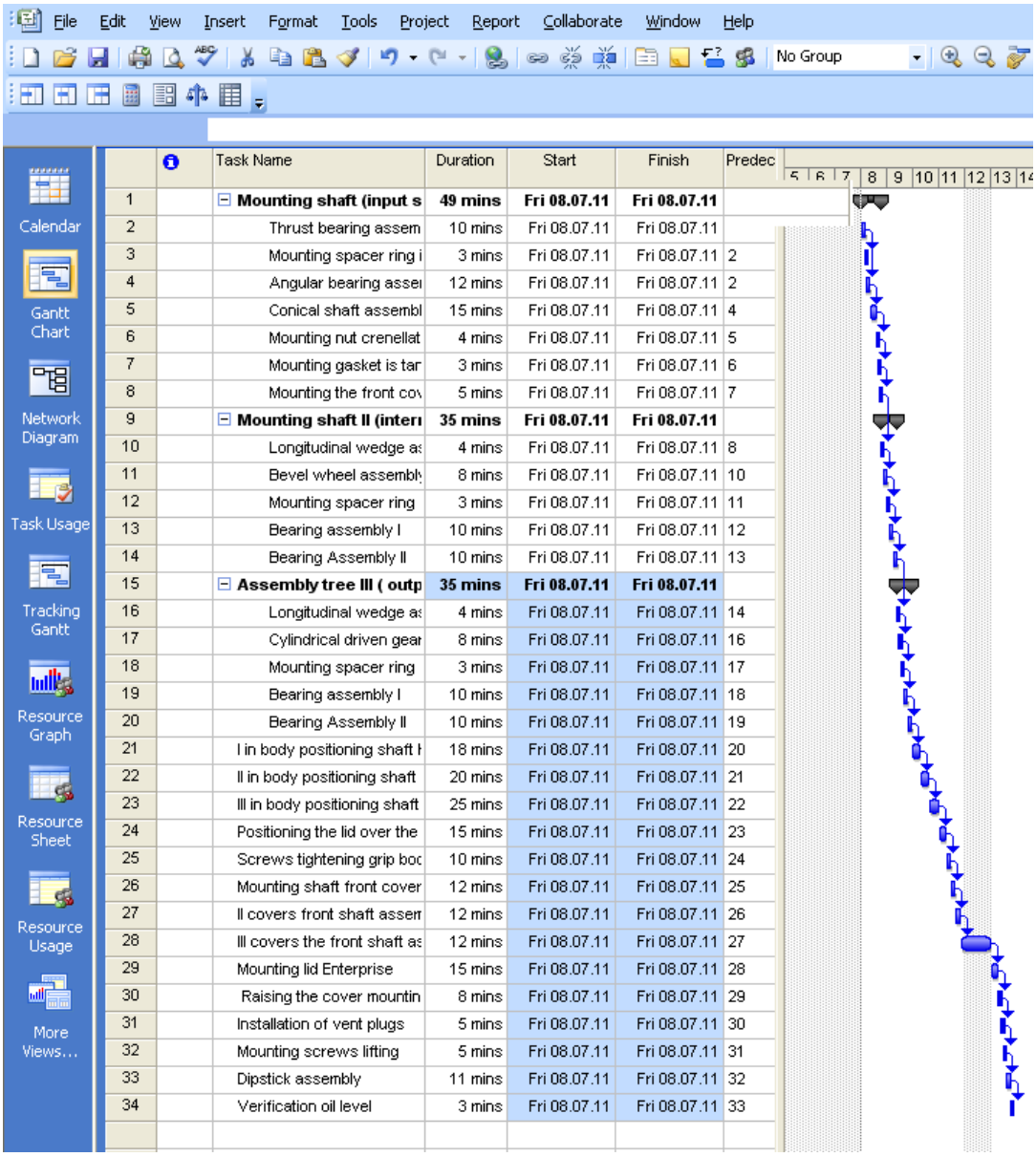


Fig. 5. Gantt chart view

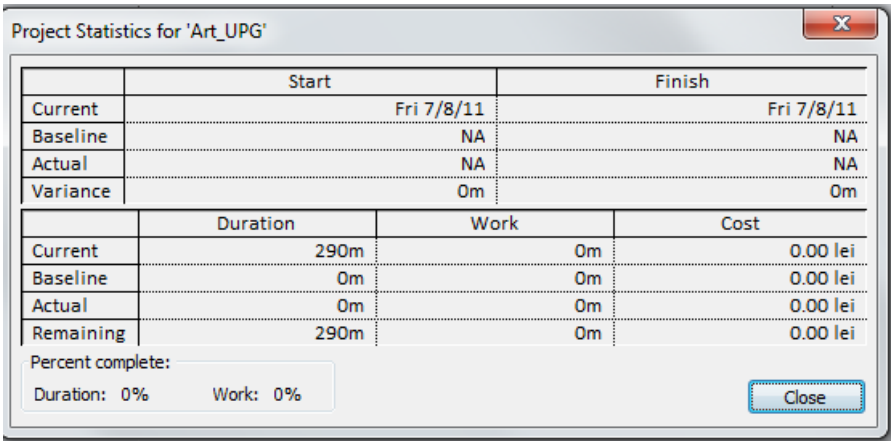


Fig. 6. Determine the total length of the technological process

	Task Name	Leveling Delay	Duration	Start	Finish	Succes
1	**Mounting shaft (input s**	**0 emins**	**49 mins**	**Fri 7/8/11**	**Fri 7/8/11**	
2	Thrust bearing assemb	0 emins	10 mins	Fri 7/8/11	Fri 7/8/11	3,4
3	Mounting spacer ring in	0 emins	3 mins	Fri 7/8/11	Fri 7/8/11	
4	Angular bearing assem	0 emins	12 mins	Fri 7/8/11	Fri 7/8/11	5
5	Conical shaft assembly	0 emins	15 mins	Fri 7/8/11	Fri 7/8/11	6
6	Mounting nut crenellate	0 emins	4 mins	Fri 7/8/11	Fri 7/8/11	7
7	Mounting gasket is tan j	0 emins	3 mins	Fri 7/8/11	Fri 7/8/11	8
8	Mounting the front cove	0 emins	5 mins	Fri 7/8/11	Fri 7/8/11	10
9	**Mounting shaft II (interı**	**0 emins**	**35 mins**	**Fri 7/8/11**	**Fri 7/8/11**	
10	Longitudinal wedge ass	0 emins	4 mins	Fri 7/8/11	Fri 7/8/11	11
11	Bevel wheel assembly	0 emins	8 mins	Fri 7/8/11	Fri 7/8/11	12
12	Mounting spacer ring	0 emins	3 mins	Fri 7/8/11	Fri 7/8/11	13
13	Bearing assembly I	0 emins	10 mins	Fri 7/8/11	Fri 7/8/11	14
14	Bearing Assembly II	0 emins	10 mins	Fri 7/8/11	Fri 7/8/11	16
15	**Assembly tree III (outp**	**0 emins**	**35 mins**	**Fri 7/8/11**	**Fri 7/8/11**	
16	Longitudinal wedge ass	0 emins	4 mins	Fri 7/8/11	Fri 7/8/11	17
17	Cylindrical driven gear a	0 emins	8 mins	Fri 7/8/11	Fri 7/8/11	18
18	Mounting spacer ring	0 emins	3 mins	Fri 7/8/11	Fri 7/8/11	19
19	Bearing assembly I	0 emins	10 mins	Fri 7/8/11	Fri 7/8/11	20
20	Bearing Assembly II	0 emins	10 mins	Fri 7/8/11	Fri 7/8/11	21
21	I in body positioning shaft I	0 emins	18 mins	Fri 7/8/11	Fri 7/8/11	22
22	II in body positioning shaft	0 emins	20 mins	Fri 7/8/11	Fri 7/8/11	23
23	III in body positioning shaft	0 emins	25 mins	Fri 7/8/11	Fri 7/8/11	24
24	Positioning the lid over the	0 emins	15 mins	Fri 7/8/11	Fri 7/8/11	25
25	Screws tightening grip boc	0 emins	10 mins	Fri 7/8/11	Fri 7/8/11	26
26	Mounting shaft front cover	0 emins	12 mins	Fri 7/8/11	Fri 7/8/11	27
27	II covers front shaft assen	0 emins	12 mins	Fri 7/8/11	Fri 7/8/11	28
28	III covers the front shaft as	0 emins	12 mins	Fri 7/8/11	Fri 7/8/11	29
29	Mounting lid Enterprise	0 emins	15 mins	Fri 7/8/11	Fri 7/8/11	30
30	Raising the cover mountin	0 emins	8 mins	Fri 7/8/11	Fri 7/8/11	31
31	Installation of vent plugs	0 emins	5 mins	Fri 7/8/11	Fri 7/8/11	32
32	Mounting screws lifting	0 emins	5 mins	Fri 7/8/11	Fri 7/8/11	33
33	Dipstick assembly	0 emins	11 mins	Fri 7/8/11	Fri 7/8/11	34
34	Verification oil level	0 emins	3 mins	Fri 7/8/11	Fri 7/8/11	

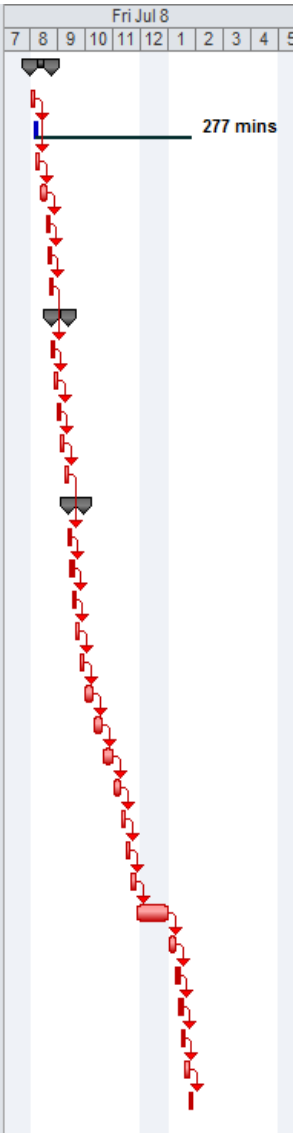


Fig. 7. Identify the critical path

	Resource Name	Type	Max.	Std. Rate	Ovt. Rate	Cost/Use	Accrue	Base
1								
2	Team leader	Work	100%	15.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard
3	Mechanical locksmith	Work	100%	15.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard
4	Locksmith fitter	Work	100%	15.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard
5	A mechanical operator	Work	100%	10.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard
6	Operator Mechanical 2	Work	100%	8.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard
7	Mechanical Operator 3	Work	100%	5.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard
8	Mechanical Operator 4	Work	100%	7.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard
9	Operator mechanic 5	Work	100%	7.00 lei/hr	0.00 lei/hr	0.00 lei	Prorated	Standard

Fig. 8. Establishing the necessary resources

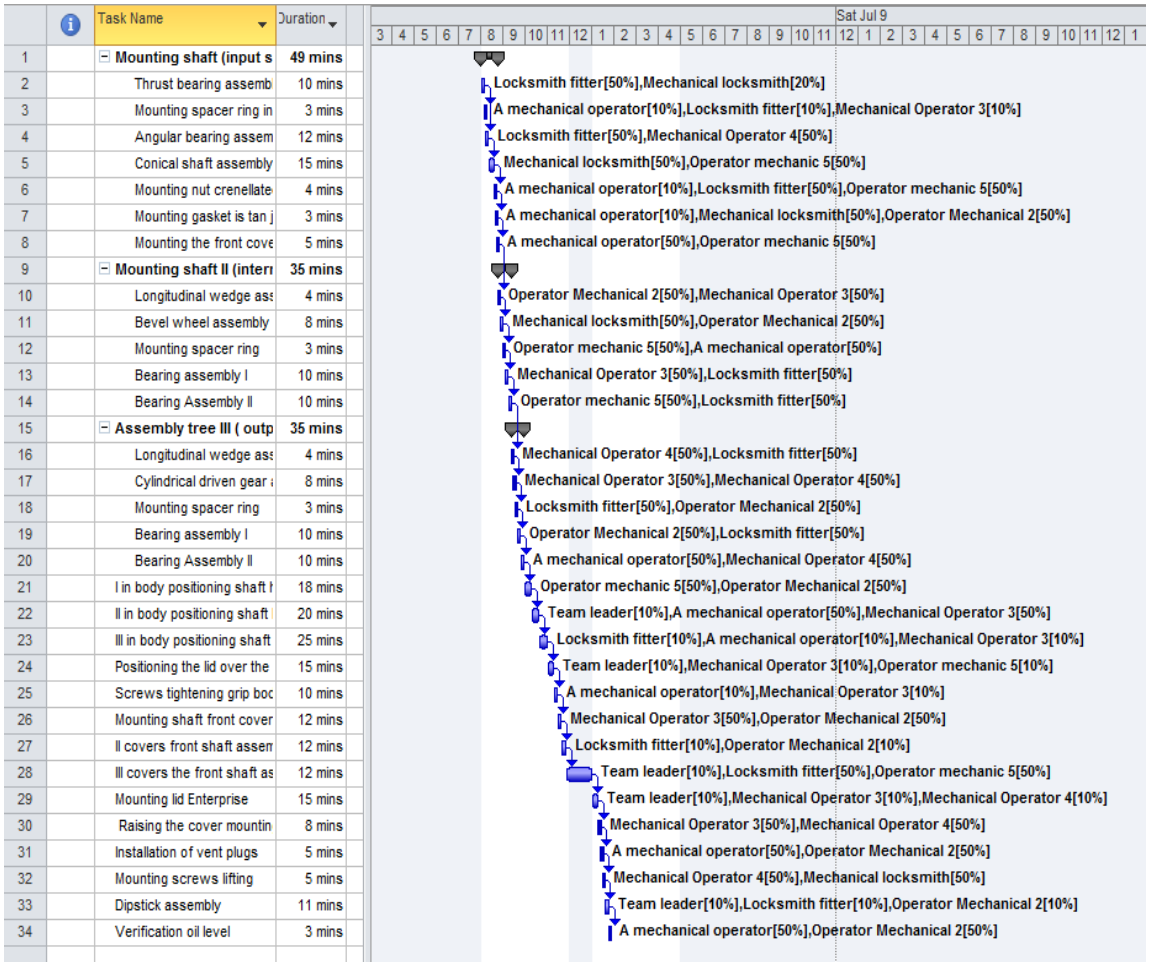


Fig. 9. View the allocation of resources on activities

8. Determination of total duration, and cost calculation of the technological process of assembly - figure 10.

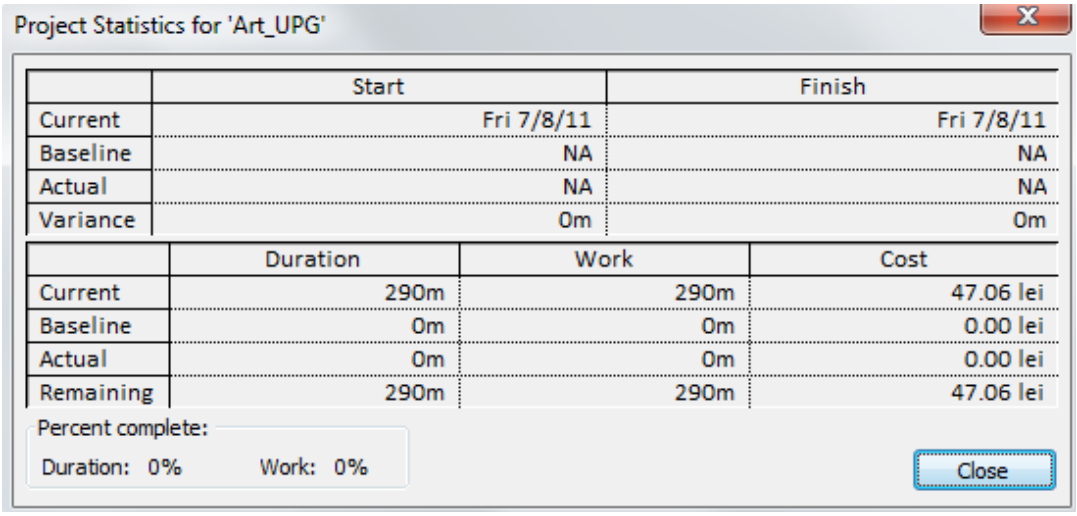


Fig. 10. Determination of total duration, and cost calculation and technological process of assembly

Conclusions

The ultimate goal of any process or installation is getting a quality product that is characterized by precision dimensional geometric shape precision surfaces and the mutual position.

In this sense, technical progress and the rapid pace of development in Construction Industry conditions require increasingly more demanding. Currently, for correct operation of the bodies, not only constructive and precision dimensional concepts are decisive, but also the quality of the assembly surfaces of these organs.

Usefulness of the proposed method is justified by:
- systemic approach that allows the assembly works elimination time not worked;
- composition of models which can be changed quickly by using the computer system;
- fast adaptation to changes that occur in the cycle of assembly (modification of working time, resource replacement, indicating disruptions of work etc.);
- establishment of patterns of large sections of thing works, tracking efficiency, permanent record of work that is done, the rapid control of the working stages, emphasizing activities that do not fit in the specified parameters, rapid analysis of the costs of resources used.

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Aspecte privind problematica lucrărilor de montaj în construcţia de maşini

Rezumat

Procesul tehnologic de montaj reprezintă o parte a procesului de producţie prin care piesele finite sunt grupate într-o succesiune logică, în subansamble, ansamble, agregate.
În aceste condiţii, lucrarea prezintă o modalitate de analiză a procesului tehnologic de montaj a unui reductor de turaţie, utilizând produsul informatic Microsoft Project.