THE MINISTRY OF HIGHER AND SECONDARY SPECIALIZED
EDUCATION OF THE REPUBLIC OF UZBEKISTAN
ANDIJAN MACHINE – BUILDING INSTITUTE

FACULTY ”AUTOMATICS AND ELECTROTECHNOLOGY ”

CHAIR “MATERIAL - SCIENSE AND NEW MATERIALS TECHNOLOGY”

THE EXPLANATION LETTER OF DIPLOMA PROJECT

The theme of diploma project: **Heat treatment of spring details**

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The head of chair: **Q. Xalmerzayev**

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Economic part **A. Sotvoldiyev**

ANDIJAN - 2016

_____

(name of higher educational institute)

_____

(name of the faculty)

_____ Chair

TASK

ON ACCOMPLISHING
DIPLOMA PROJECT

_____

(student name and surname)

1.Theme of the diploma project _____
_____
_____

2.Veritied according to the institution's decree N ____ on ____20___year.
Information on the accomplishment of the diploma project: _____
_____
_____

3.Information included in the explanatory letter (texts in hand-written (70-80 pages) or electronic format (40-50 pages)):

a) On existing technological process _____

_____
_____
_____

b) On calculation section of automatic setting system _____

_____
_____

c) On construction automated guided system of technological processes :
_____

_____
_____
_____

d) On technology labor safety sections: _____

_____
_____
_____

e) The list of Used literature: _____

_____
_____
_____

4. The list of draft the diploma project: _____

a) The draft of structural diagram the automated system: _____

_____
_____
_____

b) The draft of functional diagram the technological process: _____

_____
_____
_____

c) The draft of principal the technological process:_____
_____
_____
_____

d) General appearance of main panel: _____

_____
_____
_____

5.Calendar plan on the diploma project sections.

№	Diploma project sections	Start date	End date	Signature (supervisor)	Supervisor name
1	Conclusion	28.01.2016	1.02.2016		Z.Madaminov
2	Importance of the theme	03.02.2016	06.02.2016		Z.Madaminov
3	Commentary of the literatures	07.02.2016	15.02.2016		Z.Madaminov
4	Main part	16.02.2016	05.03.2016		Z.Madaminov
5	Technologic part	08.03.2016	31.03.2016		Z.Madaminov
6	Economic part	01.04.2016	28.04.2016		A.Sotvoldiyev
7	The safety activity of the life	29.04.2016	14.05.2016		N.Qobulova
8	Conclusion and offers	14.05.2016	17.05.2016		Z.Madaminov
9	The list of the used literatures	17.05.2016	18.05.2016		Z.Madaminov
10	Attachment	19.05.2016	24.05.2016		Z.Madaminov

6. Date of assigning a task 27.12.2015 yil

7.Date of submitting diploma project: _____

Head of faculty: R.Zulunov

Supervisor: Z.Madaminov

Task has been accepted for accomplishment: J. Abdunabiyev

Head of the chair: Q.Xalmerzayev

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Introduction.

Heavy machinery industry's largest and leading network of engineering of the Uzbekistan. The significance of scientific and technological achievements in all sectors of the national economy, increasing labor productivity, mechanization and automation of production processes, improve product quality and production efficiency. Car manufacturing. This network of new industries. Organization and development of the internal needs of the country, despite being a very important issue for the former center of automobile production the way you like with them. In 1992, with South Korea's Daewoo Corporation of the Republic of Uzbekistan, Asaka cotton trailers, moving the plant to produce passenger cars on the basis of the foundation stock of the joint venture.

Resolution of the President of the Republic of Uzbekistan dated May 20, 2011 № PP-1533 On measures to strengthen the material-technical base of higher educational institutions and cardinal improvement of quality of training of highly qualified specialists

(with amendments and additions as of 29.08.2013 was)

In order to radically improve the quality of training of specialists with higher education, demand in sectors of the economy, based on the strengthening and modernization of material-technical base of higher educational institutions, equipping them with modern teaching and research laboratory equipment, optimization of areas and specialties of training of highly qualified personnel, further improving the educational process by improving educational standards, the introduction of advanced educational technologies and forms of education, strengthen the stimulation of work of teaching staff.

To approve developed by the Working Group, formed by the decree of the President of the Republic of Uzbekistan of 28 September 2010 № PP-3501, the modernization program of the material and technical base of higher

educational institutions and cardinal improvement of the quality of training in 2011-2016, including:

The set of measures to strengthen and develop the material-technical base of higher educational institutions for the period 2011-2016 years, according to the ; The complex of measures on optimization of areas and specialties for training of highly qualified personnel, the further improvement of the state educational standards in accordance with ; Supplying mentioned decisions, we can instance followings:

Persistently high economic growth rates and services have created necessary conditions for realization of important priorities - **providing employment, particularly employment of graduates of professional colleges and higher educational institutions.** In 2015, more than 980 thousand jobs were created, including more than 60% - in rural areas. More than 480 thousand college graduates have been employed. Commercial banks have given soft loans for organizing own business in the amount of about 280 billion soums, which exceeds this indicator of 2014 by 1.3 times. In 2015, we achieved sustained high rates of economic growth that created a solid basis **for further income growth, improving living standards and quality of our people's life.** Salaries of employees of budgetary institutions, pensions and scholarships were increased by 21.9%, and the real aggregate income per capital increased by 9.6%. Said: **In report of the president of the republic of Uzbekistan Islam Karimov at the enlarged meeting of the cabinet of ministers dedicated to the socio-economic development in 2015 and the most important priorities of economic program for 2016.**

And on this report Islam Karimov spoke following ideas:

The most important priority envisaged for 2016 economic program should be unconditional continued initiated system of democratic reforms and modernization of the country, deep structural changes in the economy, especially in industry and

agriculture, advanced development and protection of private property, entrepreneurship and small business, ensuring macroeconomic balance.

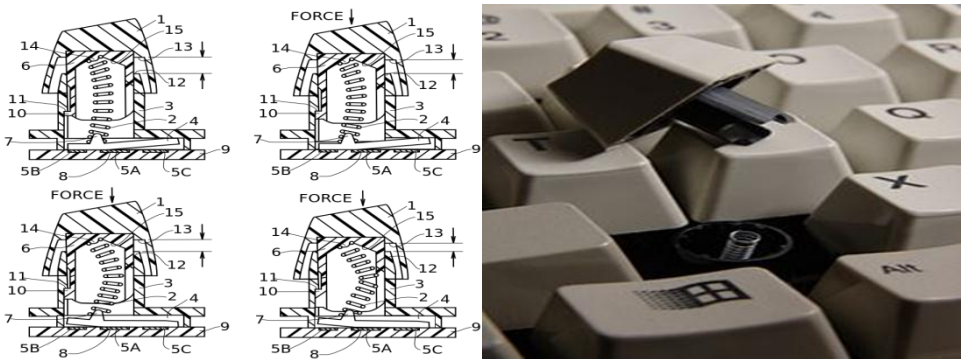
We can not imagine the industry: (machine building, aircraft, watch manufacturing and others) without spring details. The portion of these details are very important in the industry. The reason why I chose this theme for my graduation qualification work is to develop once more heat treatment process of the spring, to extend working period of the springs, to decrease the time of the heat treatment of the springs and without effecting to the financial expense and consist of clarifying to the problems. The development of the route of the spring manufacturing technology

1. Slugging wire
2. Prebaking full annealing (thermal station blacksmith shop)
3. Hardness control
4. Mechanical treatment (pre-machining)
5. Final heat treatment hardening, tempering medium (thermal land machine shop)
6. Hardness control (thermal land machine shop)
7. Final machining (machine shop)
8. Quality control of the finished part (machine shop)

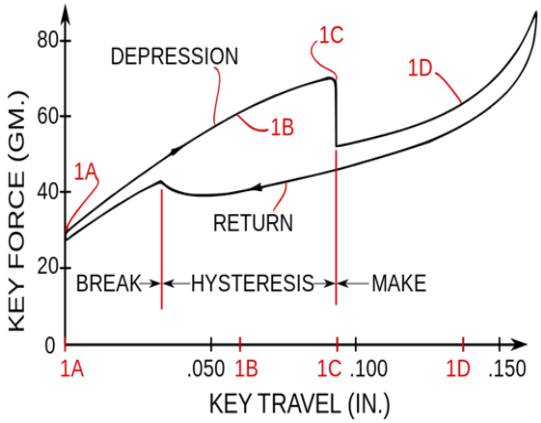
Heat treatment. Full pre-annealing, tempering the final average vacation. Metal hardness after tempering should be 370-440 HB (40-47hrts). If technological is wound and tempered spring from the same heat, after winding its re-heated for hardening. Mechanical treatment (for removal of residual compressive deformation, processing ends). permanent deformation is removed after cooling-off compression of the spring until it touches turns delayed 5-8 seconds. The ends of the springs with a diameter greater than 8 mm handle on the front end and semolina roughing machines with cooling oil, with a diameter of up to 8mm twig on turning benches.

IMPORTANCE OF THE THEME

Since its very beginning, mankind has used the elastic characteristics of natural materials and forged metals like copper and iron. Fibulas made from copper were used to hold together clothing and can be seen as forerunners of modern safety pins. Since the Middle Ages in Europe the development of iron production and wire manufacturing had a reciprocal influence on the applications of springs and spring manufacturing technology. Today's armaments industry began with weapons like crossbows and rifles that were based on spring mechanisms. At the beginning of the 14th century watchmakers used springs to manufacture clockworks. Craftsmen improved continuously the quality and the shape of springs. In the 18th century spiral springs were generally used for clocks and fob clocks. Today, the automotive industry is the most important customer of spring manufacturers, but other industries which produce investment and consumer goods need large quantities of springs too. Springs are needed nearly everywhere. As there is a huge variety of applications and a lot of aspects to be considered, the requirements of all spring applications can't be satisfied with a few standardized spring products. Spring manufacturers can be assured of their competitiveness if they have experience, mental flexibility, an aptitude for technical contexts, product and production knowhow, modern production equipment, and creativity to help their customers discover further spring applications and new markets. In industrialized countries, nearly everyone uses springs each day. Most people are not aware of it because many springs seem insignificant or are hidden to the bare eye. However, when it fails. Think of when the pressed push-button of a PC keyboard doesn't jump back into its initial position or a toaster does not return a slice of bread. Consider what could happen if the pressed-down accelerator pedal of a car remains in its position instead of returning back. This is a potentially frightening scenario. In classical physics, a spring can be seen as a device that stores potential energy, specifically elastic potential energy, by straining the bonds between the atoms of an elastic material.



Regardless of the particular function of a spring, it can be said that all springs work according to a principle: By changing their shape, they store, transform or set mechanical energy free. Springs are elastic, meaning they return to their initial shape after having been unloaded. Springs are also used to absorb impacts or vibrations.



Importance of heat-treatment — With a steel of a given composition, proper heat-treatments may be applied which, of themselves, will first alter in form or degree some of its specific properties, or second, practically eliminate one or more of these, or third, add certain new ones. Physical properties of size, shape and ductility are examples of the first case; an example of the second case is found in the heating of steel beyond its hardening temperature, which takes away its magnetism, making it nonmagnetic; and an example of the third case is the fact that agregate degree of hardness may be added to steel by the process of hardening. In this connection it must be understood that, strictly speaking, hardness is a relative term and all steel has some hardness. There are three general heat-

treatment operations: annealing, hardening — with which this chapter will deal and tempering. In all of these the object sought is to change in some manner the existing properties of the steel; in other words, to produce in it certain permanent conditions. The controlling factor in all heat-treatment is temperature. Whether the operation is annealing, hardening or tempering, there is for any certain steel and particular use thereof a definite temperature point that alone gives the best results. In sufficient temperatures do not produce the results sought. Excessive temperatures, either through ignorance of what the correct point is or through inability to tell when it exists, cause " burned " steel; this is a common failing, resulting in great loss. Very slight variations from the proper temperature may do irreparable damage. Due to temperature variation alone, carbon steel may be had in any of three conditions: first, in the unhardened or annealed state, when not heated to temperatures above 1382 ^{0}C. second, in the hardened state, by heating to temperatures between1382 and 1532 ^{0}C. Third, in a state softer than the second though harder than the first, when heated to temperatures which exceed 1532^{0}C.

Commentary of the literatures

1. ***Resolution of the President of the Republic of Uzbekistan dated May 20, 2011 №PP-1533 On measures to strengthen the material-technical base of higher educational institutions and cardinal improvement of quality of training of highly qualified specialists***

In order to radically improve the quality of training of specialists with higher education, demand in sectors of the economy, based on the strengthening and modernization of material-technical base of higher educational institutions, equipping them with modern teaching and research laboratory equipment, optimization of areas and specialties of training of highly qualified personnel, further improving the educational process by improving educational standards, the introduction of advanced educational technologies and forms of education, strengthen the stimulation of work of teaching staff.

2. ***President of the Republic of 08.07.2014. "The optimization of the structure of the Academy of Sciences of the Republic of Uzbekistan, as well as the integration of academic science and higher education, measures to strengthen the" No. PP-2204***

The Academy of Sciences of the Republic of Uzbekistan, Ministry of Higher and Secondary Special Education, Ministry of Finance, the Ministry of Economy and optimization of the structure of scientific institutions of the Academy of Sciences as well as to strengthen the scientific potential of higher educational institutions carried out the following activities:

3. ***Composition and heat treatment of steel.*** "E. F. Lake" (London 1910) The annealing of steel consists of the thermal treatment used in carrying it above the temperature at which its highest point of transformation occurs, and then allowing it to cool gradually. This point of transformation is that at which the steel becomes non-magnetic and it is physical Structure changes. If a pyrometer is used to measure the temperature of the steel in heating or cooling, it will show a point at

which the rapid change in temperature ceases for a time, and the recording chart will show a line nearly at right angles to that of the rise or fall curve.

Hardening, when applied to steel, is generally understood to mean the heating of the metal to a high temperature and then plunging it into a bath for the purpose of suddenly cooling it. While this definition holds good on most steels, a few alloying materials now used reverse this and make the metals air-hardening, that is, their hardest and toughest state is obtained by a slow-cooling process rather than a sudden one.

4. ***Heat-treatment of steel.*** **"**The industrial press new York**"** (New York the industrial press 1914). Effect of Heat-treatment. With a steel of a given composition, proper heat-treatments may be applied which, of themselves, will first alter in form or degree some of its specific properties, or second, practically eliminate one or more of these, or third, add certain new ones.

The process of hardening steel consists essentially of heating the steel to the required temperature and quenching it suddenly in some cooling medium. The methods of heating and the different kinds of quenching baths used will be explained in detail later. Generally speaking, the furnaces used for the heating of steel for hardening are heated either by gas, oil, electricity or solid fuel.

5. ***справочник конструктора машиностроителя*** **(Ануриев_Т3) 1979.**

In determining the size of the springs must be borne in mind that when $v_0 > v_{cy}$, in addition tangent torsion stresses, contact stresses arise from the collision of turns, moving by inertia after decelerating and stopping the mating parts with springs. If the collision turns absent, have better endurance spring with low voltages τ_3, the spring I class, intermediate cyclic spring II class and worse-spring III class. In the presence of an intense impact endurance coils is placed on a reverse order, no increases with decreasing and increasing with τ_3.

6. ***Information of internet.(****google.ru, lex.uz, albest.ru and others****)*** Summary heat treatment is that the heating or alloy steel to a certain temperature, holding at this temperature, followed by rapid cooling or slow change is desired properties of

steel or alloy. Change of properties is due to take place in the steel transformation modifying metal microstructure. The main types of heat treatment of steel and alloys are annealing, normalizing, hardening, tempering and aging. Annealing is called the process of heating the steel to a temperature in the range of transformations at this temperature exposure and followed by slow cooling with the furnace.

Usually when hot steel is quenched, most of the cooling happens at the surface, as does the hardening. Different quenching media provide a variety of cooling rates. Quenching can be done by plunging the hot steel in water. The water adjacent to the hot steel vaporizes, and there is no direct contact of the water with the steel.

Main part.

Springs are made of 60C2A, 65C2BA, 50XFA and others stamp of steels:

Characteristics for grade 60S2A (60C2A)

Grade :	60S2A (60C2A)
Substitute:	60C2H2A, 60C2Г, 50ХФА
Classification :	Spring structural steel

Chemical composition in % for grade 60S2A (60C2A)

C	Si	Mn	Ni	S	P	Cr	Cu
0.58-0.63	1.6-2	0.6-0.9	Max 0.25	Max 0.025	Max 0.025	Max 0.3	Max 0.2

Temperature of critical points for grade 60S2A (60C2A).

Ac_1 = 770 , $Ac_3(Ac_m)$ = 820, $Ar_3(Arc_m)$ = 770, Ar_1 = 700,Mn = 305

Mechanical properties under T=20°C for grade 60S2A(60C2A)

Assortment	Dimension	Direct.	□в	□T	□5	□	KCU	Heattreatment
-	Mm	-	MPa	MPa	%	%	kJ / m^2	-
Rolledstock, GOST 14959-79			1570	1375	6	20		Quenching 870°C, oil, Drawing 420°C,
Bandannealed , GOST 2283-79	0.1 – 4		880		8			
Bandcold-worked , GOST 2283-79	0.1 – 4		780-1180					

Brinell hardness for 60S2A (60C2A) (annealing) GOST 14959-79	HB 10^{-1} = 269 MPa
Brinell hardness for 60S2A (60C2A) (withoutheattreatment) GOST 14959	HB 10^{-1} = 302 MPa

Physical properties for grade 60S2A (60C2A)

T	E 10^{-5}	□ 10^{6}	□	□	C	R 10^{9}
Grade	MPa	1/Grade	Watt/(m·Grade)	kg/m^3	J/(kg·Grade)	Ohm·m
20	2.12		28	7680		
100	2.06	11.8	29	7660	510	
200	1.98	12.7	29	7630	510	
300	1.92	13.3	30	7590	520	
400	1.81	13.7	30	7570	535	
500	1.78	14.1	30	7520	565	
600	1.58	14.5	29		585	
700	1.44	14.4	29		620	
800	1.34	12.2	28		700	
T	E 10^{-5}	□ 10^{6}	□	□	C	R 10^{9}

Characteristics for grade 65S2VA (65C2BA)

Grade :	65S2VA (65C2BA)
Substitute:	60C2A, 60C2XA
Classification :	Springstructuralsteel

Chemical composition in % for grade 65S2VA (65C2BA)

C	Si	Mn	Ni	S	P	Cr	W	Cu
0.61-0.69	1.5-2	0.7-1	Max 0.25	max 0.025	max 0.025	max 0.3	0.8-1.2	max 0.2

Mechanical properties under T=20°C for grade 65S2VA(65C2BA)

Assortment	Dimension	Direct.	$\sigma_в$	σ_T	δ_5	ψ	KCU	Heattreatment
-	mm	-	MPa	MPa	%	%	kJ / m^2	-
Bandannealed, GOST 2283-79	0.1 - 4		880		8			
Bandcold-worked, GOST 2283-79	0.1 - 4		780-1180					
Steel, GOST 14959-79			1860	1665	5	20		Quenching 850°C, oil, Drawing 420°C,

Brinell hardness for 65S2VA (65C2BA)(without heat treatment) GOST 14959-79	HB 10^{-1} = 321 MPa
Brinell hardness for 65S2VA (65C2BA) (heat treatment) Rolled stock GOST 14959-79	HB 10^{-1} = 285 MPa

Physical properties for grade 65S2VA (65C2BA)

T	E 10^{-5}	□ 10^{6}	□	□	C	R 10^{9}
Grade	MPa	1/Grade	Watt/(m·Grade)	kg/m^3	J/(kg·Grade)	Ohm·m
20	2.11		27	7850		
100	2.06	11.5	27		475	
200	2	12.5	28		500	
300	1.95	13	29		510	
400	1.85	13.5	29		530	
500	1.78	13.8	29		555	
600	1.54	14.3	29		580	
700	1.36	14.5	28		615	
800	1.31	13.5	28		690	
T	E 10^{-5}	□ 10^{6}	□	□	C	R 10^{9}

Characteristics of the material 50KHFA (50HFA, 50XΦA).

Material :	50KHFA (50HFA, 50XΦA)
Substitute:	60C2A, 50XΓΦA.
Classification :	Spring structural steel

Chemical composition in % of the material 50KHFA (50XΦA)

C	Si	Mn	Ni	S	P	Cr	V	Cu
0.46-0.54	0.17-0.37	0.5-0.8	max 0.25	max 0.025	max 0.025	0.8-1.1	0.1-0.2	max 0.2

Temperature of critical points of the grade 50XΦA.

Ac_1 = 752 , $Ac_3(Ac_m)$ = 788 , $Ar_3(Arc_m)$ = 746 , Ar_1 = 688,Mn = 300

Mechanical properties under T=20°C of the material 50XΦA.

Assortment	Dimension	Direct.	$\sigma_в$	σ_T	δ_5	ψ	KCU	Heat treatment
-	Mm	-	MPa	MPa	%	%	kJ / m^2	-
Forging	100 - 300		835	685	12	38	490	Quenching and drawing
			1300	1100	8	35		Quenching 850°C, oil, Drawing 520°C,
Bandannealed			900		8			

Brinell hardness of the material 50KHFA(50XΦA) (quenching, tempering) ,	HB 10^{-1}= 262 - 311 MPa

Physical properties of the material 50KHFA (50XΦA) .

T	E 10^{-5}	α 10^6	λ	ρ	C	R 10^9
Grade	MPa	1/Grade	Watt/(m·Grade)	kg/m^3	J/(kg·Grade)	Ohm·m
20	2.18		40	7800		320
100	2.15	11.7	39	7780	490	
200	2.1	12.2	38	7750	505	
300	2	12.9	37	7720	510	

THERE ARE THREE CLASSES OF SPRINGS. Chart-1

Class	Group	Spring force at max deformation	Wire		GOST
			Stamp of steel	Diameter *d, mm*	
I	1	0,100-85	GOST 1050-74	0,2-5,0	9389-75 (Class I)
	2	0,100-80			9389-75 (Class II and IIA)
	3	14-000	60C2A; 65C2BA 50XFA	3-12	14963-69
II	1	0,150-140	GOST 1050-74	0,2-5,0	9389-75 (Class I)
	2	0,125-125			9389-75 (ClassII and IIA)
	3	23,6-1000	60C2A, 65C2BA 50XFA	3-12	14963-69
III	2	31,5-1400	60C2A 65C2BA GOST 14963-69	3-12	14963-69

Springs can be classified depending on how the load force is applied to them:

Tension/extension spring – the spring is designed to operate with a tension load, so the spring stretches as the load is applied to it.

Compression spring – is designed to operate with a compression load, so the spring gets shorter as the load is applied to it.

Torsion spring – unlike the above types in which the load is an axial force, the load applied to a torsion spring is a torque or twisting force, and the end of the spring rotates through an angle as the load is applied.

Constant spring - supported load will remain the same throughout deflection cycle **Variable spring** - resistance of the coil to load varies during compression

They can also be classified based on their shape:

Coil spring – this type is made of a coil or helix of wire **Flat spring** – this type is made of a flat or conical shaped piece of metal. **Machined spring** – this type of spring is manufactured by machining bar stock with a lathe and/or milling operation rather than coiling wire. Since it is machined, the spring may incorporate features in addition to the elastic element. Machined springs can be made in the typical load cases of compression/extension, torsion, etc. **Serpentine spring** - a zig-zag of thick wire - often used in modern furniture.

The most common types of spring are:

Cantilever spring – a spring which is fixed only at one end. **Coil spring** or **helical spring** – a spring (made by winding a wire around a cylinder) and the conical spring. These are in turn of two types: **Compression springs** are designed to become shorter when loaded. Their turns (loops) are not touching in the unloaded position, and they need no attachment points. **A volute spring** is a

compression spring in the form of a cone, designed so that under compression the coils are not forced against each other, thus permitting longer travel.

Tension or extension springs are designed to become longer under load. Their turns (loops) are normally touching in the unloaded position, and they have a hook, eye or some other means of attachment at each end.

Hairspring or **balance spring**– a delicate spiral torsion spring used in watches, galvanometers, and places where electricity must be carried to partially rotating devices such as steering wheels without hindering the rotation. **Leaf spring** – a flat spring used in vehicle suspensions, electrical switches, and bows. **V-spring** – used in antique fire arm mechanisms such as the wheel lock, flintlock and percussion cap locks. Also door-lock spring, as used in antique door latch mechanisms.

Other types include :

Belleville washer or **Belleville spring** – a disc shaped spring commonly used to apply tension to a bolt (and also in the initiation mechanism of pressure-activated landmines). **Constant-force spring** — a tightly rolled ribbon that exerts a nearly constant force as it is unrolled.

Gas-spring –a volume of gas which is compressed.

Ideal Spring – the notional spring used in physics: it has no weight, mass, or damping losses. The force exerted by the spring is proportional to the distance the spring is stretched or compressed from its relaxed position.

Main spring – a spiral ribbon shaped spring used as a power source in watches, clocks, music boxes, windup toys, and mechanically powered flashlights.

Rubber band – a tension spring where energy is stored by stretching the material.
Spring washer – used to apply a constant tensile force along the axis of a fastener.
Torsion spring – any spring designed to be twisted rather than compressed or extended. Used in torsion bar vehicle suspension systems.

Wave spring – the name applies to a multitude of wave shaped springs, washers and expanders, including linear springs, all of which are generally made with flat wire or discs which are marcelled according to industrial terms , usually by die-stamping, into a wavy regular pattern resulting in curvilinear lobes. Round wire wave springs exist as well. Types include : wave washer, single turn wave spring, multi-turn wave spring, linear wave spring, marcel expander, interlaced wave spring and nested wave spring amongst others.

Technical part.

Endurance and resistance springs.

In determining the size of the springs must be borne in mind that when $v_0 > v_{cy}$, in addition tangent torsion stresses, contact stresses arise from the collision of turns, moving by inertia after decelerating and stopping the mating parts with springs. If the collision turns absent, have better endurance spring with low voltages τ_3, the spring I class, intermediate cyclic spring II class and worse-spring III class. In the presence of an intense impact endurance coils is placed on a reverse order, no increases with decreasing and increasing with τ_3. In the same manner and is resistant, reducing the residual strain or precipitate springs. Regulation means the endurance and stamina of cyclic springs within each class with the same set value of the working stroke changes are the difference between the maximum shear stress in torsion and shear stressτ_3 at operating strain τ_3. increasingτ_3 - τ_2 difference cause an increase in stamina and endurance cyclic springs all classes, while increasing the size of the nodes. decrease in τ_3 - τ_2 difference is accompanied by a reversal of service quality and the size of the spaces in the arrangements for the accommodation of the springs

Spring classes **CHART-2**

Spring classes	Springs	Loading	Endurance in cycles of at least	Inertial collision turns
I	Compression and tension	Cyclic	$5x10^6$	Absent
II	Compression and tension	Cyclic and static	$1x10^5$	Absent
III	Compression	Cyclic	$2x10^3$	May occur

Spring Calculation; Means For Calculating Formula **Chart-3**

Parameter name and size designation	Formula, standarts and methods of calculation
Maximum shear stress in torsion (taking into account the curvature of the coil) τ_3, kgs/mm^2	**Determined according to Table 2**
The critical speed of the compression spring v_{kr}, m/s	$v_{kr} = \frac{\tau\left(1-\frac{P_2}{P_3}\right)}{\sqrt{2G\rho}}$; *from* $\sqrt{2G\rho}$ = 3.58 (1)
Shear modulus. G, kgs/mm^2	for spring steel **G = 8x10^3**
Material density $\rho, kgs * s/mm^4$	for spring steel ρ = **8x10^{-10}**
Spring hardness *Z, kgs/mm*	$Z = \frac{P_2-P_1}{h} = \frac{P2}{F2}$ (2)
Number of side coils *N*	$n = \frac{z_1}{z}$ (3)
The total number of turns n_1	**reference number of turns** $n_1 = n = n_2$ *(4)*
The average diameter of the spring D_0 , mm	$D_0 = D-d$ *(5)*
Spring index *C*	$C = \frac{D_0}{d}$ **(6)**
Pre-deformation F_1, mm	$F_1 = \frac{P_1}{z}$ **(7)**
Working strain F_2, mm	$F_2 = \frac{P_2}{z}$ **(8)**
Maximum deformation (compression in contact sludge turns when tested tension spring) F_3, mm	$F_3 = \frac{P_3}{z}$ **(9)**
Spring height at maximum strain H_3, mm	$H_3 = (n_1+1-n_3)d$, (10) **stretching springs** $H_3 = H_0+F_3$ (10a)
The height of the spring in a free condition H_0, mm	$H_0 = H_3+F_3$ *(11)* **stretching springs** $H_0 = (n_1+1)d$ *(11a)*
Spring height in the pre-strain H_1 (node defines a compression spring dimensions)	$H_1 = H_0+F_1$ *(12)* $H_1 = H_0+F_1$ *(12a)*

Parameter name and size designation	Formula, standarts and methods of calculation
Spring height at the operating strain H_2 (node defines a tension spring dimensions excluding hooks)	$H_2=H_0-F_2$ (13) stretching springs $H_2=H_0+F_2$ (13a)
Spring step *t, mm*	$t=f_3+d$ (14) stretching springs $t = d$ (14a)
Expanded spring length (excluding extension spring hooks) *L, mm*	$L \approx 3.2\ D_0 n_1$ (15)
Spring weight *Q, kg*	$Q \approx 19.25 \times 10^{-6}\ D_0 d^2 n_1$ (16)
Volume W, occupied by the spring Mm^3	$W=0.758\ D^2 H_1$ (17)
The spring force in the pre-deformation P_1, kgs	Appointed or calculated by the mechanism of work conditions
Spring force at the operating strain (corresponding to the largest forced movable link in the mechanism) P_2, kgs	
Power way *h, mm*	
The highest rate of displacement of the movable end of the spring when loaded or unloaded v_0, *m/s*	
Endurance, number of cycles to failure N	
The outer diameter of the spring D,mm	Pre-assigned based on the construction site. specified for 2-table
Relative inertia gap compression spring	$\delta = 1 - \frac{P_2}{P_3}$. (18) To compress the springs 1 and 2 class δ= 0.05/0.25; stretching springs Springs for single Class 3 δ=0.05/0.10;
Spring force at maximum strain P_3, kgs	$P_3=\frac{P_2}{1-\delta}$ (19)
The diameter of the wire *d,mm*	
The rigidity of one turn z_1, *kgs/mm*	
Maximum deformation of one turn f_3, *mm*	

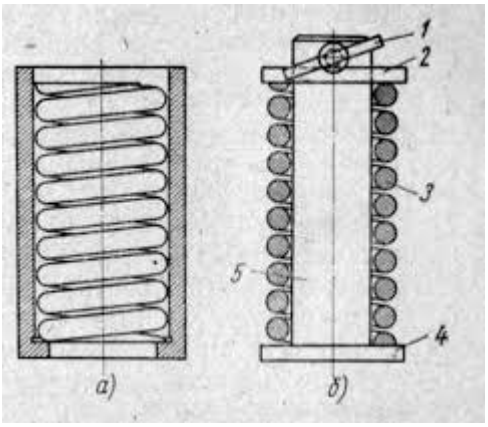
HEAT TREATMENT OF SPRING

Summary heat treatment is that the heating or alloy steel to a certain temperature, holding at this temperature, followed by rapid cooling or slow change is desired properties of steel or alloy. Change of properties is due to take place in the steel transformation modifying metal microstructure. The main types of heat treatment of steel and alloys are annealing, normalizing, hardening, tempering and aging. Annealing is called the process of heating the steel to a temperature in the range of transformations at this temperature exposure and followed by slow cooling with the furnace. Annealing is used to improve the structure of steel to improve its machinability, stress relief, as well as to prepare for the subsequent heat treatment. Annealing reduces hardness and increases the toughness of the steel. The normalization process is called heating the steel to a temperature above the transformation range, holding at this temperature followed by cooling in air. Normalization is achieved by improving the structure of the steel, the reduction of internal stresses and increased mechanical properties. Tempering of steel called a heating process to a temperature within the range or above its transformation, soaking at this temperature followed by quenching in water, oil or another medium. Hardened steel in most cases require further heat treatment (tempering). The primary purpose of tempering is to obtain steel with high hardness, strength and wear resistance. However, hardened steel is especially fragile and easily destroyed .pod of shock and bending stresses. The hardened parts are always large internal stress. In order to reduce internal stress and increasing the viscosity of the steel is tempered. The release process is called metal heating after quenching to a temperature below the transformation range, holding at this temperature and cooling. Vacation enhances toughness of the steel while maintaining the tensile strength and elasticity and reduces internal stresses. Sometimes, in order to stabilize the properties and sizes of products, etc. To the properties and dimensions have not changed over time, the product is subjected to aging. Aging is a process of long-term exposure of steel products at room temperature

(natural aging) or low-temperature heating with a small delay (artificial aging). In the process of heat treatment may occur marriage. When the annealing and normalizing may arise following marriage: decarburization, overheating of the metal, metal burnout. Decarburization - burning carbon from the metal surface during subsequent tempering that may lead to cracking. Overheating occurs when the metal is heated to a temperature exceeding the set, or the Slow metal in the furnace. When overheated grains coarsen metal. This leads to lower strength, toughness and promotes the formation of cracks during quenching. Overheating of the steel can be eliminated again by annealing or normalization. Metal burnout - oxidation of the grain boundaries, leading to a loss of strength of steel, is the incorrigible defect. When quenching the most dangerous type of marriage are incorrigible hardening cracks resulting from the excessively rapid cooling as a result of large internal stresses. Other types of marriage are the decarbonization during quenching, overheating and warping of parts. Overheating eliminatere-annealing, and in order to avoid warping, parts quenched in special dies and fixtures. A large number of parts in the machines takes shock loads and works to abrasion. Such parts (gears, driving wheel crane, the work rolls of rolling mills for cold metal, etc..)Should have a high hardness and wear resistance of the surface layer and the core of a viscous solid. This combination of properties can be achieved when the surface hardening induction-heating, and the flame quenching and tempering in the electrolyte. Quenching of high-alloy steels and structural transformations occurring in them are not fully become possible and to obtain a high hardness is not fully utilized. To increase the hardness, a homogeneous structure of steel and to stabilize the cold treatment details sizes used at temperatures ranging from 12 to 120°C, which is used for refrigerating machines or dry ice and alcohol or acetone. Mixtures provide cooling to 73°C. To relieve internal stresses after cold treatment every detail is tempered at low temperatures. (150-200°C), high hardness and wear resistance of the surface layer parts reach the chemical-thermal treatment, an artificial change chemical composition of the surface layers of steel with a thickness of hundredths and tenths of 1 mm. The

types of chemical and thermal processing are: cementation, cyanidation, nitriding, aluminizing, chrome. Cementation - heating mild steel (0.08-0.30% carbon) in carburizer (carburizing environment) to a temperature transitions or above holding at this temperature and rapid or slow cooling. When cementing a result of saturation of the surface layer of carbon is its hardening preserving soft and sticky inner zone. Cyanidation - heating the metal in sianizatore, saturating carbon steel and nitrogen at a temperature of typically 800 - 950 °C, holding at this temperature and cooling. Cyanidation increases the hardness and wear resistance of the surface of parts made of steel with a carbon content of 0.10 to 0.40%, as well as from high-chromium and high-speed steels. Cementation and cyanidation process is usually accompanied by hardening and tempering to obtain a high surface hardness (HRC56 - 67). Nitriding–heating the steel in gaseous ammonia at a temperature not lower than 450°C, a prolonged exposure at this temperature, and cooling. This process improves the wear resistance and corrosion resistance of a thin surface layer of the steel parts. Before nitriding parts subjected to quenching and tempering at 600°C for hardness HRC28 - 32. Aluminizing- diffusion of aluminum into the steel, increases the heat resistance. Plating - diffusion process a chromium steel, the hardness increases, and heat and corrosion resistance. In order to obtain the desired properties surface layers become saturated as boron (borating), silicon (siliconizing) and etc. The heat treatment has an extremely large influence on the properties of the metal and the quality of the springs. The type and heat treatment regimes prescribed depending on the steel grade, the profile of the work piece, spring size and conditions of service and the nature of the work springs. Patenting of steel is heated to a temperature above the transformation range, followed by cooling in a bath of molten lead or salt, or in the air. Patenting is achieved increasing the metal's ability to cold plastic deformation, as well as improved physical and mechanical properties. With a strict implementation of the technology of thermal processing and high qualification treater guaranteed high quality and reliable operation of the spring. The spring steels have low thermal conductivity. In this regard, some features should be considered heating for hardening some grades

of spring steel alloys. For example, high manganese steel before heating for quenching is preheated to a temperature of 400 - 500°C. Therefore, the steel is heated for hardening steps. Consequently, the risk of crack formation upon heating to the quenching temperature decreases.



Device for thermal treatment of springs.

A)with spring planting in the glass B)with the planting of the spring on the frame.

1- stop, 2- removable upper vital support platform 3- lower supporting platform 4-frame

Quenching is carried out as follows. Party springs are placed and fixed at the bottom of the mesh metal basket. Springs preheated, if required by the technology of steel processing, and then placed in an oven heated to a predetermined temperature and maintained at this temperature until the metal around the warm section. Exposure time depends on the size of the wire cross section and the brand steels. After that, the quenching of the quench medium. To prevent warping during heating for quenching a compression spring fastened to the heat treatment of soft steel wire, connecting Mechanical (non-business) with coils of wires. Sometimes the device (Fig. 1) used to prevent warping and distortion of the spring forms of channel and ordinary beams. For hardening of large springs iron cage used. The collar has the shape of a bar, wherein the shoulder holes for mounting the spring. The collar is filled springs and installed in the furnace for

heating. Quenching is carried out with gentle immersion springs quenching medium together with a holder. Quenching for spring steels may be oil, water, air and other liquid quench medium is placed in a special tank, which has a cooling system. For controlling the quench fluid temperature at quenching in water is very rapid cooling, which promotes the formation of cracks in the spring material. Such hardening is used for spring steels are very rare, but if used, it is added to water different impurities (lime soaps, chalk and others.) in order to reduce cooling rate spring steel. Quenching temperature has a great influence on the structure and properties of the steel after hardening. For example, if the oil temperature before quenching is 60 °C, the spring does not get the full hardening and spring quenching in oil heated to a temperature of 30 °C , gives the required hardness. Oil is the most common medium for quenching. Its use ensures the production of high quality springs with the smallest marriage by heat treatment. All of quenching media have different thermal conductivity, heated and most of the medium layers are in the top of the quench tank. To ambient temperature was uniform over the whole volume there through compressed air is blown through a special tube. Apply other methods of quench cooling and stirring the media. After quenching is tempered spring to increase viscosity and to reduce internal stresses resulting in quench hardening. Spring Vacation is usually carried out in the selling ovens, which can be fiery, electric muffle. Most vacation springs operate in salt baths. Temperature and time-delay when you leave depends on the grade of steel, and the diameter of the spring wire. Accommodation of patented wire springs consists in heating them to a temperature of 250 - 350 °C and holding at this temperature for 15 - 30 min. If you do not produce a holiday springs from patented wire, then at three or more crimping the contact turns loose the spring height is reduced and the spring makes the draft without altering the number of turns and increases in diameter. When you leave for such springs the greatness on rainfall at three or more compression reduced almost by half, and the elastic properties are increased. Where in the outer diameter of the spring is released to keskol decreases and the number of turns is increased by 1-2%. Heat treatment of

the springs reduces the residual deformation due to reduction of internal stresses, increases the elastic properties and viscosity, thus ensuring high quality and reliable performance springs. Usually when hot steel is quenched, most of the cooling happens at the surface, as does the hardening. Different quenching media provide a variety of cooling rates. Quenching can be done by plunging the hot steel in water. The water adjacent to the hot steel vaporizes, and there is no direct contact of the water with the steel. This lows down cooling until the bubbles break and allow water contact with the hot steel. As the water contacts and boils, a great amount of heat is removed from the steel. With good agitation, bubbles can be prevented from sticking to the steel, and thereby prevent soft spots. Water is a good rapid quenching medium, provided good agitation is done. When the fastest cooling rate is required, water solutions are used as quenching media. When suddenly quenched, the martensite is formed. This is a very strong and brittle structure. However, water is corrosive with steel, and the rapid cooling can sometimes cause distortion or cracking. Oil is used when a slower cooling rate is desired. Since oil has a very high boiling point, the transition from start of martensite formation to the finish is slow and this reduces the likelihood of cracking. When slowly quenched it would form austenite and pearlite which is a partly hard and partly soft structure but oil quenching results in fumes, spills, and sometimes a fire hazard. Oils also are intermediate quenching media and they are ideal for quenching steels. Quenches are usually done to room temperature. Most medium carbon steel sand low alloy steels undergo transformation to 100% martensite at room temperature. When the cooling rate is extremely slow then it would be mostly pearlite which is extremely soft. However, high carbon and high alloy steels have retained austenite at room temperature. To eliminate retained austenite, the quench temperature has to be lowered. This quenching media produces the lowest cooling rate.

Manufacturing technology coiling coil springs provides the following operations: carved sticks: blank cut in a cold or hot temperature of 750-900 degree of press

shears or eccentric presses. Quick draw ends of the work piece. Before curling the ends of the blanks are heated in the slotted furnace to a temperature of 900-950 degrees. Before heating the oven should be heated du temperature 1150-1250 degrees. the length of the end of the work piece, which is heated, at least 0.8 the length of procrastination. backstay end temperature of at least 800 degrees. Heating duration 8-15 minutes. pulled on the ends of ground or forging tempering springs big iron cage used. timber holder has a shape in which the drilled holes for installation with the retreat of the spring. Complementing springs in the second set for the heating furnace. **Quenching** is performed with gentle springs immersed in the quenching medium together with a holder. Q**uenching medium**. spring steel for hardening the liquid medium may be oil, water, air and others. is placed in a special tank, which has a cooling system for controlling the temperature of the quench medium. Quenching in water is very rapid cooling, which promotes the formation of cracks in the material of the springs. A hardening spring steels are used for very rare, but if used, it is added to water different impurities (lime soaps, and chalk. etc.), in order to reduce the cooling rate of spring steel. **Vacation average**. To increase viscosity and eliminating all internal stress of the spring after quenching is tempered in two-band conveyor furnace. With the largest interval between quenching and tempering is allowed no more than 4 h. Tempering temperature should be between 430-460 degrees. Cooled in water, the temperature of which should not exceed 100 degrees, or in the air indoors. Vacation springs of patented wire is heated to a temperature of 250-350 degrees, and holding at this temperature for 15-30 minutes.

Financial accounts

1. Effective time calculation of the factory

2. Capital of expenses

3. The account results of the factory

4. To clarify financial profit

1. A fruitful working time of the factory.

In designing factory of 5 t/days heat-treatment. According to the factory's design power the number of principal mean was clarified. According to the numbers of principal means the power of the factory is clarified the following formula:

$M= P_H*T_{num}$ N t/year

Here: M= power of the factory *t/year*

P_h= means on-hour fertility

T_{num}= fertility working time of the construction.

$T_{num=} T_{kol}-T_{ton}-T_t-T_o$day(hour)

Here: T = annual calendar time.

T_{kol}=365*24=8760

For continuously working factories T_t- technical stops, T_o- stops depend on work plan, T_t=0, we accept as T_o=0.

$T_{num}=T_{kal}-T_{set}$

T_{set}= expended time for repairs.

1. Capital repair 1*360=360 hour
2. Average repair 9*16=144 hour
3. Current repair 9*8=72 hour
4. Capital of the factory.

Stop for repair 1*284 hour

Total planned 860 hour

Stopping time 360+144+72+284=860 hour or 40 day.

Fruitful working time T_{num}=8760-860=7900 hour or 325 day

Coefficient of useful work (CUW)= 7900/8760=0.9

The account of capital expenses.

The capital money of the factory consist of essential fund price and circular money. Every principle of the producing consist of working material and working subject working material carries but its producing peculiarities to the working subject. Essential producing funds are divided the followings according to main producing funds is divided the followings.

1.Active essential producing funds.

2.Passive producing funds.

Active essential producing funds include machine, apparatus, tools, transport means and others.

Passive producing essential funds include building constructions.

Active essential funds consist of the followings.

1. Inner machine construction.
2. Passing construction.
3. Electric power tools.
4. Transport means
5. Measuring and correcting tools.
6. Producing economy equipment.

Estimate price of building construction. Table-1

no	Titling	Measuring unity	Quantity	Price	Cost. So'm
1	Buildings construction	M^3	25596	643350	16467186600
2	Buildings	M^3	23456	354486	8314823616
	Total				16629647232

Construction and tools estimate cost. Table -2

N	Titling	Measure	Quantity	Price	Cost
1	Thermal furnace	Piece	11	8000000	88000000
2	Mixer	Piece	2	6500000	13000000
3	Ammonia extreme refrigerator	Piece	1	9800000	9800000
4	Gas generator	Piece	1	35000000	35000000
5	Screw press	Piece	1	1500000	1500000
6	Hydraulic press	Piece	4	1500000	6000000
7	Bathing machine	Piece	2	700000	14000000
8	Rockwel instrument	Piece	3	4000000	1200000
	Total		25		337000000

Technical process cost A_1=337000000

Tools and assembling them technical pipe passing and others cost includes.

1. Technical tools cost includes accounting tools price. (from A_1, 5%) A_2
   A_2=337000000*0.05*A_2= 16850000
2. Expenses of tools and means. (from A_2, 5%) A_3
   A_3=16850000*0.05=842500

3. The price of transport means electric power tools and equipment (from A_2, 28%) $A_4$16850000*0.28=4718000
4. The price of passing technical pipe and passing. (from $A_{2,}$ 18%) A_5
   A_5= 16850000*0.18=3033000
5. Small economy invents. (from A_2, 5%) A_6
   A_6=16850000*0.05=842500
6. The price of essential means and installed equipment in the factory.

7. $A=A_2+A_3+A_4+A_5+A_6$=16850000+842500+4718000+3033000+842500= =26286000

Essential fund amortization.

Essential funds take part in producing and they lose partly their cost during the service period. The money which need for setting up is gathered via amortization. Amortization is called to set up essential funds losed cost based on plan. On selling the production dividing amortization carries out in money figure and. On calculating price tag amortization takes part on separation form. They are said to amortization fund for setting up partly or completely

The norms of amortization is clarified with following formula.

N=[(F+R+M+A)/TF]*100%

Here: N=amortization norm.

F=initial price of essential funds

T= the period of service.

R= capital reconstruction expenses during the period of service.

M= developing expense.

It is accepted as an amortization norm. building and equipment- 8.3%

From buildings- 1.2%.

Dividing essential funds amortization. Table -3

N	Titling	Measure	Quantity	Cost	Amortization soum (so'm)
1.	Construction buildings	M^3	15596	1129765200	135571828
2.	Building and equipment	Piece	36	96556950	801422
	Total			1226322150	136373250

Annual salary fund for a worker Table-4

N	Indicates	For constantly production	For constantly production
1	Annual calendar	365	365
2	Working days 2.1. day off 2.2. holiday days.	91	104 8
3	Annual nominal	274	243
4	Planned producing day 4.1. Labor holiday 4. List of sickness work time according to	27 5	24 2
5	To do obligation of government	1	1
6	2 days for another works	1	1
7	Annual benefit1	1920	1845

Not going out work coefficient.

K_3=274/240=1.14

Employee and to clarify ITI number

a). Essential employees we considered accounted equipment and tools for doing power of the factory and based on their directing limit. On calculating vacant list is marked duty. In chemistry industry3 duty the continue of duty 8 hour working table was accepted. In clarifying workers' vacant list it should be marked not going to work K_{sql}, 14 should mark.

b). the number of assistant employee working extend is marked based on placed branch balance.

c). in chemistry industry at number 14% the number of ITI are taken employees and workers'. Mainly are taken tool of dezadarator and cristalizator tool.

Table-5

Name of jobs	Table of duty	The continue of duty	Degree of tariff	Number of employees		Changing number	Country number	The quantity of employees according to the list
				Duty	24-hour			
2	3	4	5	6	7	8	9	10
worker	4br	8	VI	1	3	1	4	11
Mixer	4br	8	VI	1	3	1	4	5
Presser	4br	8	VI	1	3	1	4	3
Load	4br	8	VI	1	3	1	4	5
Carrier	4br	8	VI	1	3	1	4	5
Workmanship	4br	8	VI	1	3	1	4	3

Accounting of assistant employees. Table -6

N	Name of jobs	Degree of tariff		Quantity according to the list	The degree of tariff (so'm)
1	Master	V		1	688.00
2	Electric	V		2	688.00
3	Electric	IV		4	734.00
4	Supervisor accounter	III		1	509.00
5	Section master	XI		1	700.00
6	Producing worker	II		2	402.00

Calculation of salary

Salary- is a payment that is paid for quantity and quality of a product which is produced by workers. It's one of the types of a national profit done for employees' and workers' benefit. For clarifying experienced workers' salary and limiting salary of the factory working condition is done by system of tariff including limited damage and hard laboratory. Salary of essential and additional work tariff category tariff degree, are calculated according to the working time. Additional 40-20% paymend. Salary is paid for continuous workers who work at night and two times for working on holiday days.

Price tag and product mark

It's said that price tag is an amount of expenses of producing expression on money. Price tag is clarified with organizing calculation including items which are spent. Expense of energy resource and products of raw materials are considered that is main expense item. On calculation mainly expenses are taken for technical progress. The expenses which outside of the factory are taken into considiration and on clarifying selling cost price. Income of the factory analysis selling cost and difference of price tag. Using degree is clarified by stable from funds and it is the more higher degree using of will be the more riser rentabillization.

Annual salary fund of essential employees. Table -7

Name of jobs	Class of tariff	Degree of tariff	Quantity according to the list	Salary fund	Essential salary fund	Bonus of main salary			
						Award	For night 40%	For evening 20%	For holiday (so'm)
2	3	4	5	6	7	8	9	10	11
Thermist	6	920.89	5	1920	6816000	2044800	1124640	281160	227200
Thermist	5	824.60	5	1920	66004800	1981440	1089792	272448	220160
Presser	4	628.04	5	1920	6029184	180875.52	994815.36	248703.84	2009728
Packer	5	824.60	5	1920	6604800	1981440	1089792	272448	220160
Packer	4	725.065	5	1920	6029472	1808841.6	994802.82	248715.72	200982.4
Master settings	4	824.60	5	1920	7054560	22116368	1164002.4	291000.6	235152

Total essential extra salary(so'm)	Additional salary		Compulsory additional salary	Annual salary fund	Insurance
	Labor holiday	Doing government obligation			
12	13	14	15	16	17
10493800	10493800	28400	104966400	115460200	16164428
10168640	101686400	27520	101713920	1188256.0	15663558.4
9282431.2	9282431.2	25121.6	928949433.6	10213186.48	14298461.07
10268640	10268400	27520	101713920	111882560	15663558.4
9282814.6	9282814.6	25122.8	92853268.8	10213608.34	14299051.68
10599183	105991830	29394	106021224	116624407	163268569
				77375040.48	10832505.66

Annual salary of assistant employees. **Table-8**

Name of jobs	Class of tariff	Degree of tariff	Quantity according to the list	Salary fund	Essential salary fund	Additional salary		
						Award	Labor holiday	Government obligation
2	3	4	5	6	7	8	9	10
Repair	5	802.62	1	1845	1269360	3608808	16501680	14760
Electric	5	802.62	2	1845	2538720	761616	33003360	29520
Electric	4	734.85	4	1845	5423193	1626957.9	70501509	59040
Supervisor accounter	3	625.02	1	1845	940820.81	282246.28	12230671.05	14760
Producing wokers	2	562.52	2	1845	1847656.8	554237.04	24019538.4	59040

Table-8

Total additional salary	Annual salary fund	Insurance
11	12	13
16897248	1816660.8	2543325.21
33794496	3633321.6	5026650.24
72187506.9	77610699.9	41360550.24
2944911686	295432506.9	10865497.9
34625860.4	3722708.9	521179.46
	49125065.2	6871500.19

ITI employees and annual salary fund of KXX (so'm) **table-9**

Name of positions	Position of work on so'm	Monthly salary	Essential salary fund	Essential salary, extra salary	Essential and extra salary	Additional salary	Annual salary fund	Insurance
2	3	4	5	6	7	8	9	10
Head of factory	1	251685	27668535		2768535	276853.5	3045394.5	12188157.8
Repair master of the factory	1	214831	2363141		2363141	236314.1	2599435.1	1039782.04
Technolog	1	204500	1701337		185284.75	2038132.2	2038132.2	815252.91
Duty master	4	169327	74767880	1664591	7643247.1	764324.71	840757181	3363028.72
Store keeper	1	114205	1256255		1256255	125625.5	1381880.5	552752.26
Secratory	1	82901	911911		911911	91191.1	1003102.1	40124034
Cleaner	4	77300	34012000		34012000	3401200.0	3741320.0	523787.8
Total							23397200.75	3275608.24

Equipment and tools expense of exsplutation Table -10

N	Expense item	Cost	comment
1	Saving equipment and tools expense of products	6131366.32	From price of equipment 6.35%
2	Amortization of equipment	8014226.85	
	Total	14145593.17	

Account of expense of the factory Table -11

N	Expense items	Cost(so'm)	Comment
1	ITI employees and KXX essential and extra salary	23397201.75	From table-9
2	Additional and essential salary fund of asissent workers	23856144.51	From table-8
3	Insure	3275608.24	From table -9
4	Insure	3339860.23	
5	Special repair expense of building constructions	56488260	From building construction cost (0.5%)
6	Saving building construction	11297652	From building constructions (1%)
7	Amortization of building constructions	13557182.82	From table-3
8	Expense of technics safety	14176003.87	
9	Other expenses	54280491.76	
10	Expense of the factory	325682950.56	

Calculation

For making products from 0.5-t/day materials.**Table-12**

N	Expense items	Measure	Price	Cost	Quantity
1	2	3	4	5	6
1	Price of metal 60C2A, 50XFA	Kg	5500.0	200	1100000
	Total		So'm		11000000
2	**Helping materials** 2.1 Endogas 2.2 Hydrogen	 Cubic meter Cubic meter	 300 2500	 469.30 938.6	 140700 2346500
	Total		So'm		2487200
3	Fuel and energy resource 3.1 technic steam 3.2 electric energy 3.3 water	 G.kal Kvt/hour M^3	 1.440 306.82 3.544	 22492.40 98.51 51.14	 971671.68 906745 5431
	Total		So'm		1883847.7
4	Essential and extra salary of essential workers		So'm		238077.05
5	Insurance		So'm		33330.79
6	Expense of explotation, saving equipment		So'm		43524.91
7	Expense of factory		So'm		1002101.39
					23820729.25

1) Price tag of product unity

   p/p = 23820729.25/30=794024.3 so’m

2) Price of realization

   R/p=794024.3*1.25=992530.3 so’m

3) Income of product unity

   R=9992530.3-794024.3=198506 so’m

4) Income of production

   ∑R= 198506*30*325=1935667500 so’m

The safety activity of the life

Safety and labor safety In the first place, because the highest value is always a man, his life and health. Neither wages nor the level of profitability of the enterprise, not the value of the manufactured product can not be a reason for neglecting the rules of safety and a justification of the existing threats to the life or health of workers. In addition, in this case it is also about values of a particular person as an employee with the knowledge inherent in it, skills and experience. Second, properly organized work to ensure the safety of employees increases discipline, which in turn leads to increased productivity, reduction in the number of accidents, equipment breakdowns or other emergency situations, that is, increases the ultimate efficiency. Thirdly, labor protection means not only ensuring the safety of workers during the performance of their duties. In fact, here also include a variety of activities: for example, the prevention of occupational diseases, the organization of proper rest and nutrition workers during work breaks, providing them with the necessary clothing and hygiene products, and even the implementation of social benefits and guarantees. The correct approach to the organization of labor protection at the enterprise, the clever use of a variety of ways to promote intangible employees give the latter the necessary sense of security, stability and governance in the interest of its employees. Thus, thanks to an established occupational safety and reduced employee turnover, which is also beneficial for the stability of the entire enterprise.

There were explosion and fire dangers in the factory where I practiced. Because When combustion takes place in an enclosed space or gas outlet obstructed, subsequent layers of the combustible mixture is heated not only by conduction but also by pressurizing them due to adiabatic compression. This increases the flame propagation velocity and may cause an explosion. ***The explosion*** - a rapid transformation of substances, accompanied by the release of energy and the formation of compressed gas capable of producing work. flame speed by the explosion reached several hundred meters per second.

The safety activity of the life is significant in Heat treatment factories. That's why it is important to analysis conditions of microclimate in the factories, to lessen rate of dust in the air, to make a program on fire and electricity safety, to support workers with personal defense means and they are one of the essential works which should be done. I carried out my pre - graduation practice at "SPZ-BEARINGS" Uzbekistan - Russia united factory and I got much practical experience on the safety activity of the life here. At the factory there is a department which is heat treating to outer and indoor links of bearings. I spent my full time there. On heat treatment to metal it is used of 380W tension electricity and heat till 150^0-900^0. It is clear to all of us, at this heat we can not act without protection means. Such a high temperature is dangerous for human life and it is considered that there is fire danger existence. Interval distance should be 1.5 meter while working with indoor furnaces. As such it is demanded to be paid attention. On this condition toxic gas parts from furnace a part from heat.

Special air cleaning pipes are used in order to lessen effect of this for workers. Metal heat treatment factory is considered that dangerous area at "D" degree burning that's why the factory must have been supported with fire safety corner. "Category D - a space in which the burnt fuel, including gas, or treated with fire-resistant material in the hot, hot or molten state (boilers, forge, machine rooms diesel power plants)". On such kind of processes action of employees is hard works part type of work. That is to say always to work on carrying out heavy loads with steady strain. Energy expense is more than 250 kkal. Also each in factory need has got industrial lighting. Because this resource is important for eye and trying. When light industrial buildings using natural light produced by direct sunlight and diffuse light of the sky and changing depending on geographic latitude, time of day and year, the degree of cloudiness and atmospheric transparency; artificial light generated by electric light sources, and combined light, in which the lack of natural light by artificial rules complementary.

Worker has to watch out for the electric current to the human body. The electric current to the human body. ***The thermal effect*** is to heat biological tissues and body fluids, which leads to overheating of the whole organism and as a consequence, metabolic disorders and related abnormalities. ***Electrolytic impact*** is the expansion of blood, plasma and other physiological fluids of the body, after which they can no longer perform their function. ***Biological effects*** associated with irritation and stimulation of nerve fibers and other organs.

Conclusion.

Springs are needed nearly everywhere. As there is a huge variety of applications and a lot of aspects to be considered, the requirements of all spring applications can not be satisfied whiz a few standardized spring products. Spring manufactures can be assured of their competitiveness if they have experience, mental flexibility, an aptitude for technical contexts, product and production equipment, and creativity to help their customers discover further spring applications and new markets. Heat treatment. Full pre-annealing, tempering the final average vacation. Metal hardness after tempering should be 370-440 HB (40-47HRC). If technologic is wound and tempered spring from the same heat, after winding its re-heated for hardening. Mechanical treatment (for removal of residual compressive deformation, processing ends). permanent deformation is removed after cooling-off compression of the spring until it touches turns delayed 5-8 seconds. The ends of the springs with a diameter greater than 8 mm handle on the front end and semolina roughing machines with cooling oil, with a diameter of up to 8mm twig on turning benches. hardening (hardening). Peening shot blasting is carried out in the installation. Hardening mode is set such that at each point of the surface is a spring under the effect of the flow fraction for 20-30 seconds. Feed fraction 70-100 kg / min, the diameter of 0.8-1.2mm pellets. After hardening of the spring must have a surface light (silver) color without areas with drafts. except for shot blasting treatment to harden springs choose method of coercion, which is to extract the compressed springs can cope for some time, and the method of multiple arms of a further hardening shot. Coersion spring is compressed when after full heat treatment and then incubated 20-40 hours and can cope then discharged. When the method of the multiple compression spring is subjected to 5-10 times the load on the process of unloading, as well as the clash of turns. Resulting residual subsidence spring receives and acquires its final height can cope with freely, but in the spring creates residual stress of the opposite sign, resulting in operation at its true stress is less than they would be without coersion. Spring gains the ability to

withstand heavy loads and has an increased working deflection for the same overall dimensions. process design the thermal springs treatment. Full annealing steel is heated to 30-50 degrees above the upper critical point for the complete conversion of the steel structure in austenite, and subsequently slow cooling to 500-600 degrees for the formation of ferrite and pearlite. Cooling speed of about 50-100 degrees / hour.

Process design of the final heat of the spring manufacturing processing.

Hardening. Tempering temperature for the steel 60S2A is 850-870 degrees. Cooling medium during quenching oil hardening doing so. Party springs are placed and fixed at the bottom of the mesh metal basket. Spring pre-heated, if required by the technology of steel processing, and then placed in an oven heated to a predetermined temperature and maintained at this heating temperature until the metal over the entire section. Duration of exposure depends on the size of the wire cross section and steel grade. After this is done into quenching medium. to prevent distortion during heating for quenching compression spring before the thermal treatment bonded mild steel wire, connecting the end turns of windings referring workers.

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