

## Andijon Mashinasozlik Instituti

**“Metrologiya, standartlashtirish va mahsulot sifati menjmenti” kafedrası 5A5310902 “Metrologiya, standartlashtirish va mahsulot sifati menejmenti” ta’lim yo’nalishi bo’yicha bakalavr Nishonov Vohobjon Hamidulla o’gli “Spark” va “Jentra” avtomobillari detallarini sifatini nazorat qilish va material sarfini optimallashtirish (“Uz Dong Won CO” qo’shma korxonasi misolida)” mavzusidagi bakalavirlik darajasini olish uchun yozilgan diplom loyihasiga**

### TAQRIZ

**Xalqaro standartlarga javob beradigan mahsulotlar ishlab chiqarish, iqtisodiyotni ustivor yo’nalishlaridan hisoblanadi! I.A. Karimov**

Muvofiqlikni baholash organlarining majburiyatlari esa me’yoriy-huquqiy hujjatlarda, shuningdek, texnik jihatdan tartibga solish sohasidagi me’yoriy hujjatlarda belgilangan talablarni bajarish, manfaatdor shaxsga sertifikatlashtirish, muvofiqlikni deklaratsiyalash, inspeksiya nazorati, yukni ortishdan oldin va (yoki) yukni tushirish vaqtidagi inspeksiya, mahsulot sinovlari, sanitariya-epidemiologiya, veterinariya, fitosanitariya xulosalari yoki ekologik ekspertiza qoidalari va tartib-taomili to’g’risida axborot taqdim etishdan iborat.

— Ya’ni, mahsulot ishlab chiqarish va xizmatlar ko’rsatish jarayonlari, menejment tizimlari va xodimlarning me’yoriy-huquqiy hujjatlar, shuningdek, texnik jihatdan tartibga solish sohasidagi me’yoriy-huquqiy hujjatlar talablariga muvofiqligini tasdiqlash, ichki va tashqi bozorlarda mahsulot hamda xizmatlarning raqobatbardoshligini oshirish, xalqaro iqtisodiy, ilmiy-texnikaviy hamkorlik va jahon savdo aloqalarida ishtirok etish, tabiiy resurslardan oqilona foydalanish hamda davlatning va jismoniy shaxslarning mol-mulki xavfsizligini ta’minlash masalalari mamlakatimiz taraqqiyotida muhim o’rin tutadi.

Muvofiqlikni tasdiqlash tizimida mahsulotni baholash natijalari to’g’risidagi ma’lumotlar ikki usuli ya’ni sertifikat yoki deklaratsiya shuningdek, muvofiqlik tanolish qo’llaniladi.

Xalqaro standartlar hamma tomonlama uyg’unlashtirish va darajali tan olinishi savdoda texnik to’siqlarni bartaraf etish va raqobatni rivojlantirishning samarali vositalaridan biridir. Fan-texnikaning shiddatli rivojlanishi, ishlab chiqarish va iqtisodiy tizimlarini yagona iqtisodiy siyosat asosida o’zaro bog’langan holda rivojlanishi hamda xalqaro savdo-sotiqni kengaytirishda muvofiqlikni baholash tizimi va bajariladigan jarayonlarni birxillashtirish zaruriyati yuzaga kelmoqda. Shuni tasdiqlab o’tish kerakki, barcha tizimlar va muvofiqlikni baholash jarayonlarida hamma qiziquvchi tomonlarni jalb qilish, ochiq-oydinlik va O’zbekiston Respublikasi Butun Jaxon Savdo Tashkilotiga a’zo bo’lish pog’onasida sabab, savdoda ortiqcha

to'siqlarni yaratmaslik, xaq-huquqlarini cheklamasligini xalqaro savdoni yengillashtirish imkonini berishi bilan mamlakatimiz iqtisodiyotida muhim ahamiyat kasb etishi, shubhasiz. Shu maqsadda dunyo bo'yicha tan olingan Xalqaro Standartlar O'zDSt/ISO, ISO /IEC, normativ xujatlar talablari bo'yicha maxsulotlarni ishlab chiqarish, ya'ni rivojlanayotgan davlatlar uchun ham muvofiqlikni baholash tizimida qator xalqaro standartlarni amaliy aniqlab bergan.

Ushbu dolzarb vazifalarni inobatga olgan bakalavr Nishonov Vohobjon Hamidulla o'g'lining diplom loyihasining mavzusi " "Spark" va "Jentra" avtomobillari detallarini sifatini nazorat qilish va material sarfini optimallashtirish ("Uz Dong Won CO" qo'shma korxonasi misolida)" ga bag'ishlanganligini inobatga olib, hozirgi kundagi dolzarb masalalardan biri deb hisoblayman.

Bakalavirlik diplom loyihasi 3 bobdan iborat.

1-bob. Mahsulot sifati va sifat nazorati tahliliga bag'ishlangan.

2-bob. Mahsulot sifatini nazorat qilishda X-R nazorat kartalarini qo'llash bo'yicha ma'lumotlar keltirilgan.

3-bob. "Uz Dong Won Co" qo'shma korxonasida ishlab chiqarilayotgan "Spark" va "Jentra" avtomobillari detallarini sifatini nazorat qilish hamda materiallar sarfini optimallashtirish bo'yicha amaliy ishlar bajarilgan.

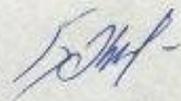
Bakalavirlik diplom loyihasida quyidagi kamchiliklarga yo'l qo'yilgan:

-diplom loyihasini yozib rasmiylashtirishda O'zDSt 1.6 talablariga rioya qilmaganligi bilindi.

-hisobot tushuntirish xatida ayrim imlo va grammatik xatolarga yo'l qo'yilgan.

Yuqorida keltirilgan kamchiliklar bakalavirlik diplom loyihasining mavqegini pasaytirmaydi va bakalavr Nishonov Vohobjon Hamidulla o'gli " "Spark" va "Jentra" avtomobillari detallarini sifatini nazorat qilish va material sarfini optimallashtirish ("Uz Dong Won CO" qo'shma korxonasi misolida)" bakalavr darajasini olish uchun yozilgan diplom loyihasi talab etilgan darajada tayyorlangan va "a'lo" bahoga loyiq, Nishonov Vohobjon Hamidulla o'g'lining bakalavirlik diplom loyiha ximoyasiga munosib deb hisoblayman.

MSMSM kafedrasi dots.



Kasimov B.I.

## Андижон машинасозлик институти

“Метрология, стандартлаштириш ва маҳсулот сифати менежменти” кафедраси 5310900 “Метрология, стандартлаштириш ва сифатни бошқариш (саноат)” таълим йўналиши бўйича бакалавр Нишонов Ваҳобжон Хамидулло ўғлининг “Spark ва Gentra автомобиллари деталлари сифатини назорат қилиш ва материал сарфини оптималлаштириш” мавзусидаги бакалавр даражасини олиш учун ёзилган Диплом лойихасига

### ТАҚРИЗ

Маҳсулот ишлаб чиқариш ва хизматлар кўрсатиш жараёнлари, менежмент тизимлари ва ходимларнинг меъёрий-ҳуқуқий ҳужжатлар, шунингдек, техник жиҳатдан тартибга солиш соҳасидаги меъёрий-ҳуқуқий ҳужжатлар талабларига мувофиқлигини тасдиқлаш, ички ва ташқи бозорларда маҳсулот ҳамда хизматларнинг рақобатбардошлигини ошириш, халқаро иқтисодий, илмий-техникавий ҳамкорлик ва жаҳон савдо алоқаларида иштирок этиш, табиий ресурслардан оқилона фойдаланиш ҳамда давлатнинг ва жисмоний шахсларнинг мол-мулки хавфсизлигини таъминлаш масалалари мамлакатимиз тараққиётида муҳим ўрин тутди.

Бунинг учун нафақат замонавий қурилмалар балки, назорат қурилмалари ҳамда самарали назорат усуллари талаб этилади. Корхонада ушбу келтирилган масалаларни ечиш учун маҳсулот сифатини оширига йўналтирилган турли хил назорат усуллари қўлланилади.

Ушбу долзарб вазифаларни инobatга олган Нишонов Ваҳобжон Хамидулло ўғлининг Диплом лойихасининг мавзуси “Spark ва Gentra автомобиллари деталлари сифатини назорат қилиш ва материал сарфини оптималлаштириш”га бағишланганлигини инobatга олиб, ҳозирги кундаги долзарб масалалардан бири деб ҳисоблайман.

Диплом лойихаси 3 бобдан иборат.

1-боб. Маҳсулот сифати ва сифат назорати таҳлиliga бағишланган.

2-боб. Маҳсулот сифатини назорат қилишда X-R назорат карталарини қуллаш бўйича маълумотлар келтирилган.

3-боб. “Уз ДОНГ ВОН КО” Кўшма корхонасида ишлаб чиқарилаётган “SPARK” ВА “JENTRA” автомобиллари деталларини сифатини назорат қилиш ва материал сарфини оптималлаштириш бўйича амалий ишлар бажарилган.

Диплом лойихасида қуйидаги камчиликларга йўл қўйилган:

- Диплом лойихасини ёзиб расмийлаштиришда O'zDSt 1.6 талабларига риоя қилмаганлиги билинди.
- Бобларнинг айрим бўлимларида баъзи бир имло ва грамматик хатоларга йўл қўйилган.

Юқорида келтирилган камчиликлар ишининг Диплом лойихасини мавқеини пасайтирмайди ва Нишонов Ваҳобжон Хамидулло ўғлининг

“Spark va Gentra avtomobilлари деталлари сифатини назорат қилиш ва материал сарфини оптималлаштириш” мавзусидаги бакалавр даражасини олиш учун ёзилган Диплом лойихаси талаб этилган даражада тайёрланган ва аъло баҳога лойиқ, Нишонов Вахобжон Хамидулло ўғлининг Диплом лойихаси химоясига муносиб деб ҳисоблайман.

Андижон ССМ-ДК 05-булим  
2-тоифали мутахасиси:



*Вахобжон Хамидулло ўғли*

А.Б.Абдуллаева.

**Bakalavrlik diplom loyihasiga  
Ingliz tilida yozilganligi bo'yicha  
TAQRIZ**

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2. **Taqrizchini ish joyi, lavozimi, ilmiy unvoni, ilmiy darajasi:** Andijon Mashinasozlik Instituti "Xorijiy Tillar" kafedrasasi assistenti.
3. **Talaba ismi-sharifi:** Nishonov Vohobjon Hamidullo o'g'li.
4. **Bakalavrluk mutahassisligi (shifri, ixtisosligi):** 5310900, Metrologiya, standartlashtirish va mahsulot sifati menejmenti (tarmoqlar bo'yicha).
5. **Diplom loyihasi mavzusi:** "Quality control of the spare parts of "Spark" and "Gentra" automobiles and optimization of material expenditure".
6. **Diplom loyihasida ingliz tili grammatikasi:** Diplom loyihasida jumalar grammatik jihatdan to'g'ri tuzilgan; gaplarning strukturasi, otlarning birlik va ko'plikda ifodalanishi, atoqli otlarni o'z o'rnida qo'llash, olmoshlar, ravishlar, fellarning zamonlar bo'yicha ifodalanishi ingliz tili grammatikasi talablariga javob beradi. Imlo qoidalariga to'liq va to'g'ri rioya qilingan. Artikllar va predloglarni qo'llanilishida ba'zi bir kamchiliklarga yo'l qo'yilgan, lekin bular ishning mazmuniga ta'sir ko'rsatmaydi.
7. **Diplom loyihasida terminalogiya va ilmiy-texnikaviy so'zlar:** atamalar va ularning ta'rifi xalqaro standartlardagi lug'at asosida keltirilgan, texnik jarayonlarni tavsiflashda ishlab chiqarishda keng qo'llaniladigan shartli texnikaviy so'zlardan foydalanilgan.
8. **Talabani ingliz tilini bilish darajasi:** Diplom loyihasida masala va muammolarning sodda va ravon yoritilishi, chet-el ilmiy adabiyotlaridan keng va samarali foydalanilishi, gaplarning mazmunan ketma-ket joylashganiga ko'ra talabani ingliz tili bo'yicha bilimi yetarli darajada ekanligini xulosa qilishimiz mumkin.
9. **Kasb odob-axloq qoidalarining buzilish xolatlari** (plagiat, ma'lumotlarni soxtalashtirish, yolg'on chitata keltirish va boshqalar): Kasb odob-axloqi qoidalarining buzilish xolatlariga yo'l qo'yilmagan. Hech qanday sohta ma'lumotlar va yolg'on sitatalar keltirilmagan.
10. **Diplom loyihasida ingliz tilini ishlatilishi bo'yicha xulosa:** Mazkur diplom loyihasi ingliz tili grammatikasi, imlo qoidalari va ilmiy mazmuni jihatidan kelib chiqib, ximoyaga qo'yilishiga tavsiya etaman.
11. **Diplom loyihasining baholanishi:** Mazkur diplom loyihasining 5 (a'lo) bahoga tavsiya etaman.

Taqrizchi: *Karimova F. A.*  
M.O'. \_\_\_\_\_

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«Machine-Building» faculty  
“Metrology, standardization and management the quality of production”  
chair**

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**QUALITY CONTROL OF THE SPARE PARTS OF “SPARK” AND  
“GENTRA” AUTOMOBILES AND OPTIMIZATION OF MATERIAL  
EXPENDITURE**

***DIPLOMA PROJECT***

For getting bachelor degree according to 5310900- “Metrology, standardization  
and management the quality of production” direction

The head of chair:	Esonova Sh
Supervisor:	Qasimov B
Life Safety:	Abdurahmonov A
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**Andijan-2016**

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# Introduction

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<i>Supervisor.</i>	<i>Qosimov B.</i>							
<i>Head of CH</i>	<i>Esonova Sh</i>							
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“Our independent state is rapidly moving towards progress. And one of the first victories - the birth of an entirely new industry for our economy – the automotive industry”.

**Islom Karimov**

### **Introduction**

In today's increasingly progressing world The Republic of Uzbekistan has being increased as an independent country based on intercommunications of free economic market.

In 1992 "State Committee for Standardization and Metrology" was established in Uzbekistan like other developed countries. In this regard, Uzbekistan state standardization, metrology and national certification systems have been composed. The main purpose from this is that to control the conformity of products that are being produced at the all plants to the international requirements.

Transition to market relations and improving the product quality provoke the creating the healthy competition and the providing the development of economics. The law of the Republic of Uzbekistan on December 28.1993 "About Metrology", " About Standardization" and "About Certification of Products and Services" were legislated in order to regulate these works and do monitor them. As a result, entrepreneurs are achieving high results at every branches of industry in our country. We can take " Automotive" industry as a clear example.

Asaka Automotive Plant is a light evidence of the potential of our Motherland and our nation. Today, on the 20th year of state independence, we deeply realize significance of achieved success. Erection of large enterprise, introduction of complicated technologies answering all international standards, their mastering by local specialists – are not beyond any states power.

Foundation of Automotive Plant construction in Uzbekistan was laid during the visit of our President Islam Karimov in June, 1992 to Korean Republic while meeting with “Daewoo Motors” Corporation activity. After a while document on

joint venture in automotive sphere establishment was signed. On March, 1993 Uzbek-South Korean JV “Uz Daewoo Auto” was established and three years later on the 19<sup>th</sup> of July, 1996 opening ceremony of Asaka Automotive Plant was held.

Asaka Automobile Plant staff, consisting of professional team, confidently made its first significant step and in 1996 three car lines were launched - Damas, Nexia, Tico in 7 modifications. Thus, consumer was provided with worthy choice due to high technical level. During the first year enterprise produced 25,3 th. of light vehicles, next year amount reached 64,3 th.

Meanwhile, specialists of automotive branch continued their work under new achievements. Five years after opening, in 2001, in honor of 10<sup>th</sup> anniversary of Independence, Plant started production of Matiz. In August, 2002 production of Nexia DOHC model was launched. In December, 2004 model raw was completed with Matiz in BEST modification. Simultaneously work on improvement of Damas vehicle characteristics was continued, as a result in February, 2006 renewed model Damas II was mastered.

On March, 2008 restyling model of Nexia was presented. That year was inaugurated with one more event: on the 21 of February, 2008 new Joint-Venture “GM Uzbekistan” was established on the base of Asaka Automotive Plant. Work went in full swing. Model raw of Uzbek cars was enlarged by new, modern and qualitative vehicles. Production of Chevrolet was launched: sedan of representative class “Epica” and SUV “Captiva”. In November Asaka Automotive Plant produces millionth vehicle. It was Lacetti model – synthesis of stylish, simple interior and dynamic sport exterior.

Especially for Lacetti production stamping of body panels, constructed welding division and reconstructed assembly line were arranged.

Inspired by success, specialists on national automotive industry did not keep us waiting and in August, 2010 “GM Uzbekistan” mastered production of global model - Chevrolet Spark. From the first days car became a favorite model of Uzbek car drivers.

"Uz Daewoo avto" Co is launching many joint-venture companies that manufacture modular and spare parts for automobiles. These kind of plants are performing in Andijan, Namangan, Fergana, and other provinces. For instance "Uz Dong Xong Co", " Uz Dong Yong Co", "Uz Koram", " Uz Dong Ju Paint Co ", "Uz Tong Xong Co" "Uz Semyung Co", "Uz Dong Wong Co", " Uz Kodji", "Avto Oyna", " Uz Avto Austem" and other many plants were launched. These plants are producing linings of automobile saloon, frontal and rear bumper, devices, panels, variety paintings, passengers sites, mufflers, automobile disks, beams and other parts of car.

Establishing the " Uz Daewoo avto" Co and plants that are related do it induces to imbibe the our country's necessities that pertain to the automobile and to create thousands of modern job. That's why our president I.A.Karimov said: " Automobile industry is becoming pillar of Uzbekistan Economy".

Nowadays " Matiz", " Damas", "Nexia", "Spark", "Lacetti", "Cobalt", "Malibu", "Captiva" and "Orlanda" have been producing in the "GM-Uzbekistan" automobile plant. They are going to produce other new models of cars in near future.

**Actuality of the theme:** "The program of further reform, structural transformation and diversification of the economy for the period 2015-2019" was approved by the President of Uzbekistan Islam Karimov in order to improve radically the business environment, large-scale privatization of state property expansion of the private sector and to reduce government's share in the economy do the strategically and economically reasonable size, reform of the corporate governance system based on international standards, farther modernization and diversification of the in industrial and agricultural production, as well as development of modern infrastructure. And this program consists of seven strategic program, which lay solid foundation for sustainable economic development of Uzbekistan in coming years. Using only one of them " Program of localization of production of finished products, components and materials" is

giving us great chance to increase the size of the products and to expand types of them. In order to achieve these goals, this theme may be foundation.

**The theme object and subject:** Object is quality control process of TIE BAR for J200 (GENTRA) that is produced in “Uz Dong Won Co”. The subject is a method SPC (X and R chart).

**The purpose and functions of the theme:** The purpose of the theme is to define of quality control and optimization of expenditure of material and indicate advantages of them.

To achieve the purpose:

- To study and analyze quality control and optimization of expenditure of material;
- To explain how X and R control chart is build.
- To recommend some benefits of control charts when production process is checked.

# Chapter I

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# CHAPTER I. PRODUCT QUALITY AND PRODUCT QUALITY CONTROL.

## 1.1 What is quality?

We all have needs, requirements, wants, and expectations. Needs are essential for life, to maintain certain standards, or essential for products and services, to fulfill the purpose for which they have been acquired. Requirements are what we request of others and may encompass our needs but often we don't fully realize what we need until after we have made our request. For example, now that we own a mobile phone we discover we really need hands-free operation when using the phone while driving a vehicle. Hence our requirements at the moment of sale may or may not express all our needs. Our requirements may include wants - what we would like to have but do not need: nice to have but not essential. Expectations are implied needs or requirements. They have not been requested because we take them for granted - we regard them to be understood within our particular society as the accepted norm. They may be things to which we are accustomed, based on fashion, style, trends, or previous experience. Hence one expects sales staff to be polite and courteous, electronic products to be safe and reliable, policemen to be honest, etc.

The word quality has many meanings: a degree of excellence; conformance with requirements; the totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs; fitness for use; freedom from defects, imperfections, or contamination; and (a phrase which is gaining popularity) delighting customers. These are just a few meanings; however, the meaning used in the context of ISO/TS 16949 is the one concerned with the totality of characteristics that satisfy needs. The "fitness for use" definition is shorter, more easily remembered and can be used when making decisions about quality.

## 1.2 Characteristics and parameters of product quality.

Any feature or characteristic of a product or service which is needed to satisfy customer needs or achieve fitness for use is a quality characteristic. When dealing with products the characteristics are almost always technical characteristics, whereas service quality characteristics have a human dimension. Some typical quality characteristics are given in the figure 1.1 below.



**Figure 1.1 Characteristics of product quality.**

These are the characteristics which need to be specified and their achievement controlled, assured, improved, managed, and demonstrated. These are the characteristics which form the subject matter of the specified requirements referred to in ISO 9000. When the value of these characteristics is quantified or

qualified they are termed quality requirements *or* requirements for quality. ISO 8402:1994 defines requirements for quality as an expression of the needs or their translation into a set of quantitatively or qualitatively stated requirements for the characteristics of an entity to enable its realization and examination.

Differences in design can be denoted by grade or class but can also be the result of poor attention to customer needs. It is not enough to produce products that conform to the specifications or supply services that meet management's requirements. Quality is a composite of three parameters: quality of design, quality of conformance, and quality of use:

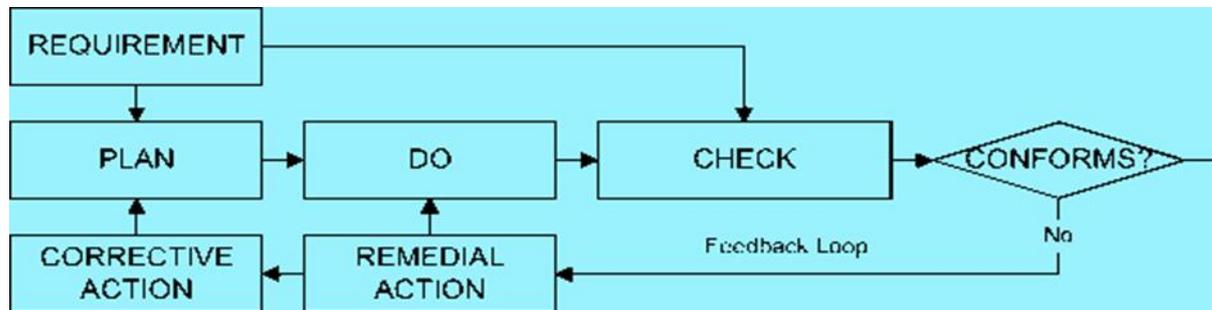
- Quality of design is the extent to which the design reflects a product or service that satisfies customer needs and expectations. All the necessary characteristics should be designed into the product at the outset.
- Quality of conformance is the extent to which the product conforms to the design standard. The design has to be faithfully reproduced in the product.
- Quality of use is the extent by which the user is able to secure continuity of use from the product. Products need to have a low cost of ownership, be safe and reliable, maintainable in use, and easy to use.

Products that do not possess the right features and characteristics either by design or by construction are products of poor quality. Those that fail to give customer satisfaction by being uneconomic to use are also products of poor quality, regardless of their conformance to specifications.

### **1.3 Product quality control and its goals.**

The ISO definition states that quality control is the operational techniques and activities that are used to fulfill requirements for quality. What the definition fails to tell us is that controls regulate performance. They prevent change and when applied to quality regulate quality performance and prevent undesirable changes in the quality standards. Quality control is a process for maintaining standards and not for creating them. Standards are maintained through a process of selection,

measurement, and correction of work, so that only those products or services that emerge from the process meet the standards.



*Figure 1.2 Quality control process.*

In simple terms, quality control prevents undesirable changes being present in the quality of the product or service being supplied. The simplest form of quality control is illustrated in Figure 1.2.

In recent times the inspection and test activities have been transferred into the production departments of organizations, sometimes retaining the labels and sometimes reverting to the inspection and test labels.

Control of quality, or anything else for that matter, can be accomplished by the following steps:

1. Determine what parameter is to be controlled.
2. Establish its criticality and whether you need to control before, during, or after results are produced.
3. Establish a specification for the parameter to be controlled which provides limits of acceptability and units of measure.
4. Produce plans for control which specify the means by which the characteristics will be achieved and variation detected and removed.
5. Organize resources to implement the plans for quality control.
6. Install a sensor at an appropriate point in the process to sense variance from specification.
7. Collect and transmit data to a place for analysis.

8. Verify the results and diagnose the cause of variance.
9. Propose remedies and decide on the action needed to restore the status quo.
10. Take the agreed action and check that the variance has been corrected.

# Chapter II

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## CHAPTER 2. USING THE $\bar{X}$ AND $R$ CONTROL CHART AT THE PRODUCT QUALITY CONTROL.

### 2.1 History and explanation of Statistical Process Control (SPC).

From the past literature survey, it is evident that some research on Statistical Process Control is carried by previous researchers but still a lot of applied research in this field is required so as to explore the utilization of SPC technique in the area of production, manufacturing and design.

The control chart, introduced in 1924, allows management to look at processes rather than just at products. Shewhart discussed the concept of statistical control. He carefully stated that a control chart is not a test of statistical significance. In his first book on quality control, Shewhart described to select the criterion (the three sigma limits). A control chart predicts that, in the absence of assignable causes, the process will operate as a random system and produce the present level of quality in the future. If that level of quality is not satisfactory, a fundamental change in the process is required.

Ishikawa added the cause-and-effect chart as an aid to brainstorming, but all the rest of the methods were the same as those recommended by Juran. The popularity of these problem-solving tools and the ease of their use caused many to adopt them. Kane carried out a study on capability indices and examined the uses of capability indices along with their estimation procedure. When properly applied, statistical tools are an effective way for improving process quality. Costa also studied the performance of  $\bar{X}$  chart with variable sample size and variable sampling intervals. He compared the performance of his charts with Shewhart  $\bar{X}$  charts and noticed that the charts proposed by him outperforms Shewhart's  $\bar{X}$  chart with a large margin.

Chen and Ding reviewed  $C_p$ ,  $C_{pk}$ ,  $C_{pm}$  and  $C_{pmk}$ , and their generalizations, and then proposed a new index  $C_{pmk}$  for any underlying distribution, which takes into account the process variability, departure of the

process mean from the target value, and proportion of nonconformity. Nelson described the situation when one should not adjust the process so that over or frequent adjustments can be avoided. He described that due to lack of control charts, the technicians have a tendency to continuously adjust the process to keep it on target value. Chang and Gan proposed the Shewhart charts for monitoring the variance component of the process. They provided the simple procedures for designing Shewhart charts for monitoring variance components.

Rahardja compared the effectiveness of the X-Chart alone to that of the individuals and Moving Range Chart Combination (X/MR Charts), in terms of Average Run Length (ARL) after designing for a common “all OK” (in control) ARL. Comparison has been made under five different non-standard conditions, including both iid and non-iid circumstances. He conclude that adding the Moving Range chart to an X-chart, while generally not helpful for detecting iid departures from standard conditions, can be beneficial in detecting some non-iid conditions. Lillrank and Kujala examined on the applicability of SPC in non-repetitive processes and open systems, non-routine processes and project-based business activities. They also proposed guidelines for adjusting the logic of common and specific causes for project-based businesses are proposed.

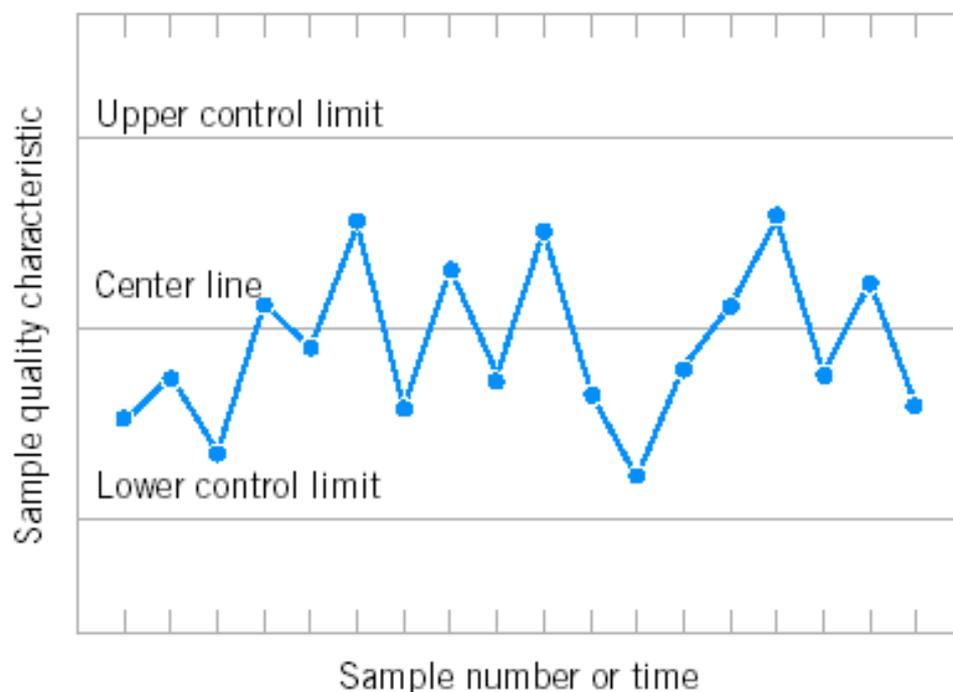
Let’s look at the three words which form SPC - Statistics, Process, and Control:

- Statistics - A way to collect, classify, present and interpret numerical data (information expressed in numbers).
- Process - A combination of machines, equipment, people, raw materials, methods and environment that produces a product. A process is how something gets done.
- Control - Directing or regulating a process so that it behaves the way it is meant to behave.

So SPC is the use of numerical data to direct or regulate the methods used

to produce a finished product.

Statistical process control (SPC) is the application of statistical methods to the monitoring and control of a process to ensure that it operates at its full potential to produce conforming product. Under SPC, a process behaves predictably to produce as much conforming product as possible with the least possible waste. While SPC has been applied most frequently to controlling manufacturing lines, it applies equally well to any process with a measurable output. Key tools in SPC are control charts and cause & effect diagrams, focused on continuous improvement. Variations in the process that may affect the quality of the end product or service can be detected and corrected, thus reducing waste as well as the likelihood that problems will be passed on to the customer.



**Figure 2.1 Appearance of control chart.**

With its emphasis on early detection and prevention of problems, SPC has a distinct advantage over other quality methods. In mass-manufacturing, the quality of the finished article was traditionally achieved through post-manufacturing inspection of the product; accepting or rejecting each article (or samples from a production lot) based on how well it met its design specifications. In contrast, Statistical Process Control uses statistical tools to observe the

performance of the production process in order to predict significant deviations that may later result in rejected product.

Two kinds of variation occur in all manufacturing processes: both these types of process variation cause subsequent variation in the final product. The first is known as natural or common cause of variation and consists of the variation inherent in the process as it is designed. Common cause of variation may include variations in temperature, properties of raw materials, strength of an electrical current etc. The second kind of variation is known as special cause of variation, or assignable cause of variation, and happens less frequently than the first. With sufficient investigation, a specific cause, such as abnormal raw material or incorrect set-up parameters can be found for special cause variations. By observing at the right time what happened in the process that led to a change, the quality engineer or any member of the team responsible for the production line can troubleshoot the root cause of the variation that has crept in to the process and correct the problem. SPC indicates when an action should be taken in a process, but it also indicates when NO action should be taken. An example is a person who would like to maintain a constant body weight and takes weight measurements weekly. A person who does not understand SPC concepts might start dieting every time his or her weight increased, or eat more every time his or her weight decreased. This type of action could be harmful and possibly generate even more variation in body weight. SPC would account for normal weight variation and better indicate when the person is in fact gaining or losing weight.

The preparatory phases of SPC involve several steps, using a number of different tools. Seven quality tools are available to help organizations to better understand and improve their processes. The essential tools for the discovery process are: Check Sheet, Cause-and-Effect Sheet, Flow Charting, Pareto Chart, Scatter Diagram, Histogram or probability plot and Control Charts.

Check sheets are simply charts for gathering data. When check sheets are designed clearly and cleanly, they assist in gathering accurate and pertinent data, and allow the data to be easily read and used. Cause-and-Effect or Fishbone

diagram are also called Ishikawa diagrams because Kaoru Ishikawa developed them to search the root causes of problem. The fishbone chart organizes and displays the relationships between different causes for the effect that is being examined. This chart helps organize the brainstorming process. The major categories of causes are put on major branches connecting to the backbone and various sub-causes are attached to the branches. Flowcharting breaks the process down into its many sub processes. Analyzing each of these separately minimizes the number of factors that contribute to the variation in the process. The Pareto chart can be used to display categories of problems graphically so they can be properly prioritized. The Pareto chart is named for a 19th century Italian economist who postulated that a small minority (20%) of the people owned a great proportion (80%) of the wealth in the land. The Scatter plot is another problem analysis tool. Scatter plots are also called correlation charts. A Scatter plot is used to uncover possible cause-and-effect relationships. It is constructed by plotting two variables against one another on a pair of axes. A Scatter plot cannot prove that one variable causes another, but it does show how a pair of variables is related and the strength of that relationship.

The probability plot is a graph of the cumulative relative frequencies of the data, plotted on a normal probability scale. The purpose of this plot is to show whether the data approximates a normal distribution. A histogram is a snapshot of the variation of a product or the results of a process. It often forms the bell shaped curve which is characteristic of a normal process. Control charts are an essential tool of continuous quality control. Control charts monitor processes to show how the process is performing and how the process and capabilities are affected by changes to the process. This information is then used to make quality improvements. Control charts are also used to determine the capability of the process. They can help to identify special or assignable cause for factors that impede peak performance.

Capability index value and comparing the calculated capability index to the desired index value, making a decision concerning process changes, and

recommending any suggestions to reach the desired goal. The popularity of capability measures continues to increase because of the mentioned benefits. Terminology associated with this subject must be relatively easy and provide a common language for discussing quality on the shop floor with suppliers as well as with customers.

The Control charts may be classified: (i) control charts for variables and (ii) control charts for attribute. The control charts based on variable data that can be measured on a continuous scale i.e. weight, volume, temperature etc. are known as control charts for variables. The control charts based on discrete data i.e. counted as 'present' or 'not' are called control charts for attributes. When constructing attribute control charts, a subgroup is the group of units that are inspected to obtain the number of defects or the number of defective items.

## **2.2 Buildings of $\bar{X}$ and $R$ control chart.**

Buildings of  $\bar{X}$  and  $R$  control chart includes following steps:

### **1. Choose a variable (characteristic):**

The characteristic chosen should be a measurable quantity, which can be expressed in numbers (size, length, weight, etc).

The characteristic should have a direct effect on the process or product and provide the prospect of reducing or preventing costs such as waste.

### **2. Choose sample groups:**

There are two main criteria for choosing a good sample group. First, the properties of the sample should be like the properties of the population. Secondly, the sample should represent the population.

Choosing items that were produced one after another is often a good way to select a quality sample group.

### **3. Choose sample size and frequency of sampling:**

Four or five is a good sample size. It is relatively quick and easy, and tends

to lower variation within a sample. The sample size should be the same each time the process is sampled.

Large samples of 20-25 are sensitive to changes in the process average. Also, the larger the sample size, the tighter the control limits.

The frequency to use in collecting the sample data must be decided on an individual basis. Sometimes, hourly checks are needed, sometimes weekly.

4. Secure control chart paper:

The chart form is handy and easy to use. Fill in the spaces at the top of the form with the needed information. Remember that the more completely filled out the form is, the more the control chart can be used as a communication tool.

5. Plot data on control chart:

The sample data is then plotted on the control chart. Calculate the range and mean to establish graph points on the chart. The upper and lower control limits and center line will be determined by other personnel.

#### Theory of $\bar{X}$ Charts

In  $\bar{X}$  chart, means of small samples (3-5) are taken at regular intervals, plotted on a chart, and compared against two limits. The limits are known as upper control limit (UCL) and lower control limit (LCL). These limits are defined as under:

$$LCL = \bar{\bar{X}} - A_2 \bar{R} \quad (2.1) \quad \text{and} \quad UCL = \bar{\bar{X}} + A_2 \bar{R} \quad (2.2)$$

Where,

$\bar{\bar{X}}$  is the target mean and factor  $A_2$  depends on sample size that is given appendix 1. The process is assumed to be out of control when the sample average falls beyond these limits.

#### Theory of Range (R) charts

In these charts, the sample ranges are plotted in order to control the variability of a variable. The center line of the R chart is known as average range. The range of a sample is simply the difference between the largest and smallest

observation.

If  $R_1, R_2, \dots, R_k$ , be the range of  $k$  samples, then the average range ( $\bar{R}$ ) is

given by: 
$$\bar{R} = \frac{R_1 + R_2 + \dots + R_k}{k} \quad (2.3)$$

The upper and lower control limits of  $R$  chart are:

Upper control limit: 
$$UCL_R = D_4 * \bar{R} \quad (2.4)$$

Lower control limit: 
$$LCL_R = D_3 * \bar{R} \quad (2.5)$$
 Where,

Factors,  $D_3$  and  $D_4$  depend only on sample size ( $n$ ) that is given in the appendix 1.

Statistics	Standard value is not given		Standard value is given	
	Central line	UCL and LCL	Central line	UCL and LCL
$\bar{X}$	$\bar{X}$	$\bar{X} \pm A_2 \bar{R}$ or $\bar{X} \pm A_3 \bar{R}$	$X_0$ or $\mu$	$X_0 \pm A \sigma_0$
$R$	$R$	$D_4 \bar{R}, D_3 \bar{R}$	$R_0$ or $d_2 \sigma_0$	$D_1 \sigma_0, D_2 \sigma_0$
$s$	$s$	$B_3 \bar{S}, B_4 \bar{S}$	$S_0$ or $C_4 \sigma_0$	$B_5 \sigma_0, B_6 \sigma_0$

**NOTE;** -  $X_0$  or  $\mu, R_0, S_0$  or  $\sigma_0$  are standard value that is given.  
 -  $A_1, A_2, A_3, B_3, B_4, B_5, B_6, D_1 \sim D_4, C_4, d_2$  – coefficients are given from appendix 1.

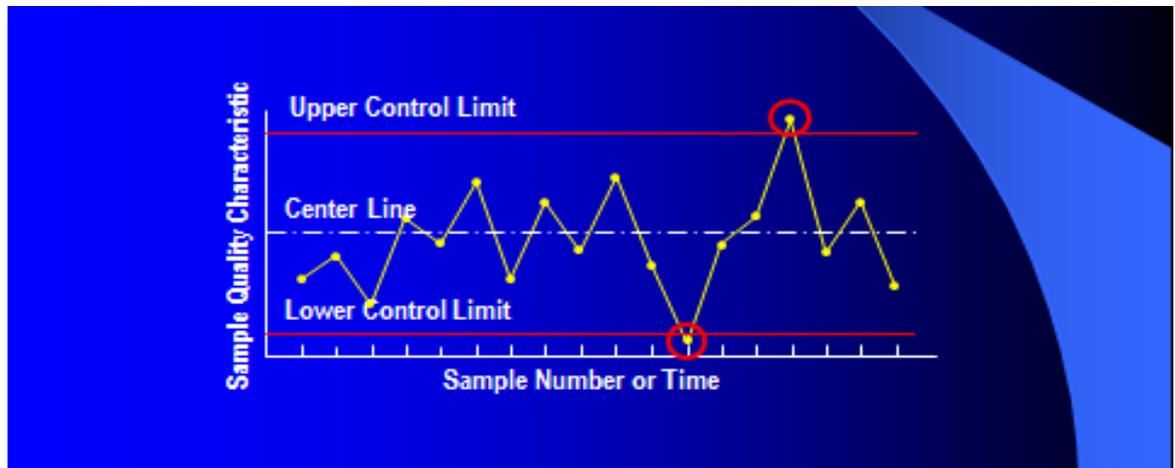
### 2.3 Indicators of instability and its causes.

Indicators of Instability are divided two groups, primary indicators and secondary indicators.

#### I. Primary Indicators

It would be primary indicators if there might be following any point outside of a control limit on a control chart:

- “1 point beyond  $\pm 3\sigma$  limits” instability



**Figure 2.2 Appearance of “1 point beyond  $\pm 3\sigma$  limits” instability.**

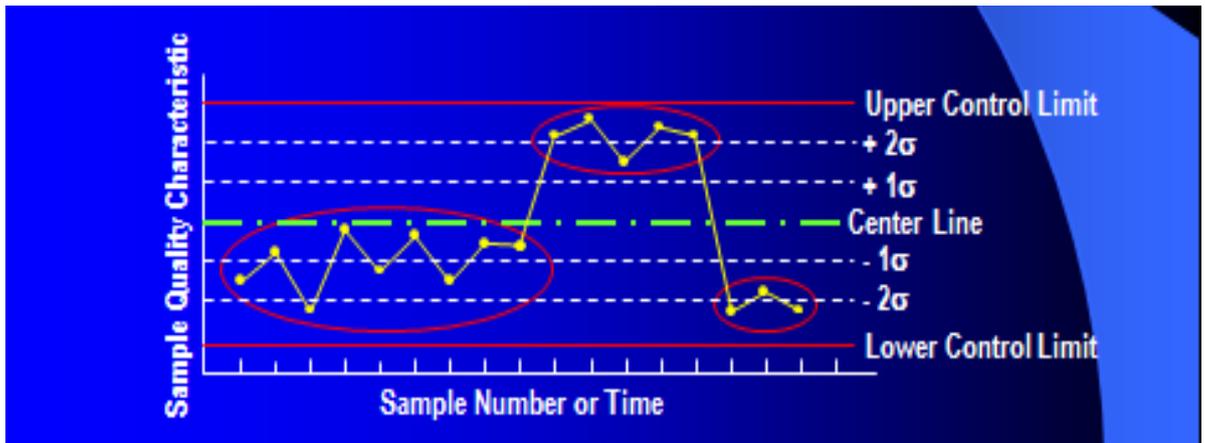
### **Common Causes**

- a) new workers, methods, raw materials or machines.
- b) change in inspection methods or standards.
- c) change in skill and/or motivation of operators.

### **II. Secondary Indicators**

It would be secondary indicators if there might be following any non-random pattern of points on a control chart:

- 1) “shift or run” instability.
  - k consecutive points (usually 7, 8 or 9) on the same side of the center line.
  - 4 out of 5 consecutive points beyond  $1\sigma$  (same side).
  - 2 out of 3 consecutive points beyond  $2\sigma$  (same side).



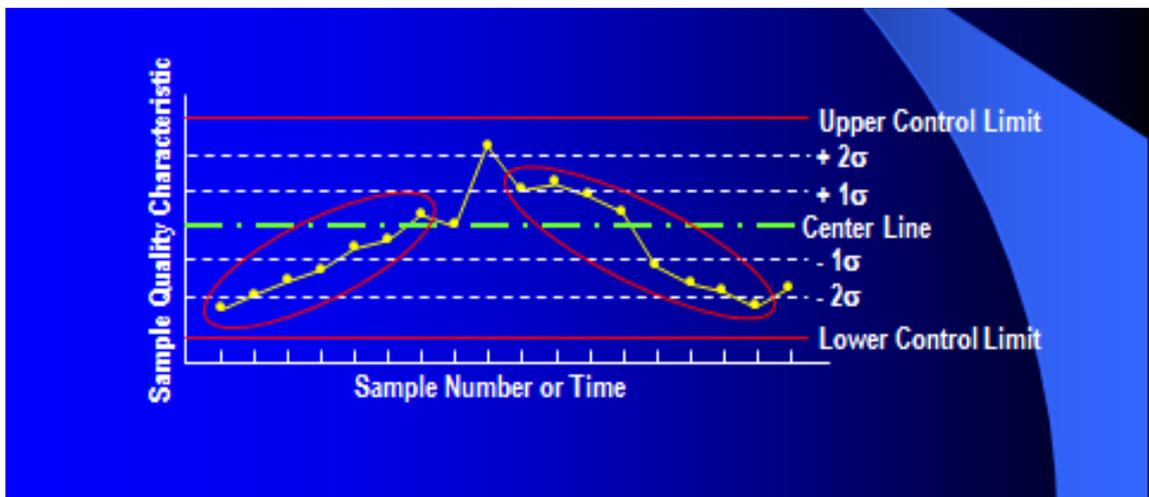
**Figure 2.3 Appearance of “shift or run” instability.**

**Common Causes of “Shift” or “Run”**

- a) new workers, methods, raw materials or machines
- b) change in inspection methods or standards
- c) change in skill and/or motivation of operators

2) “trend” instability.

- k consecutive points (usually 5, 6 or 7) moving in the same direction.

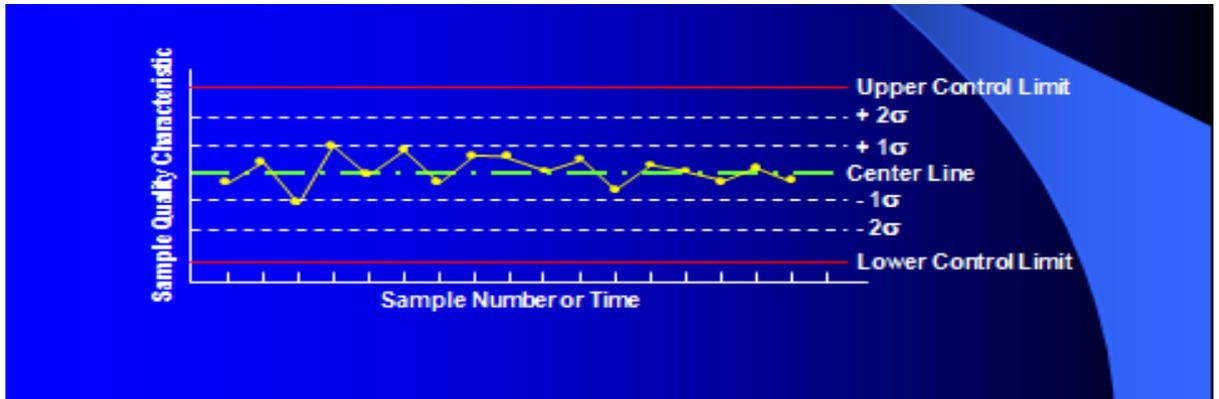


**Figure 2.4 Appearance of “trend” instability.**

**Common Causes of “Trend”**

- a) new workers, methods, raw materials or machines
- b) change in inspection methods or standards.
- c) change in skill and/or motivation of operators.

- 3) “stratification” instability.
  - points “hugging” the center line, usually within  $\pm 1\sigma$  limits.

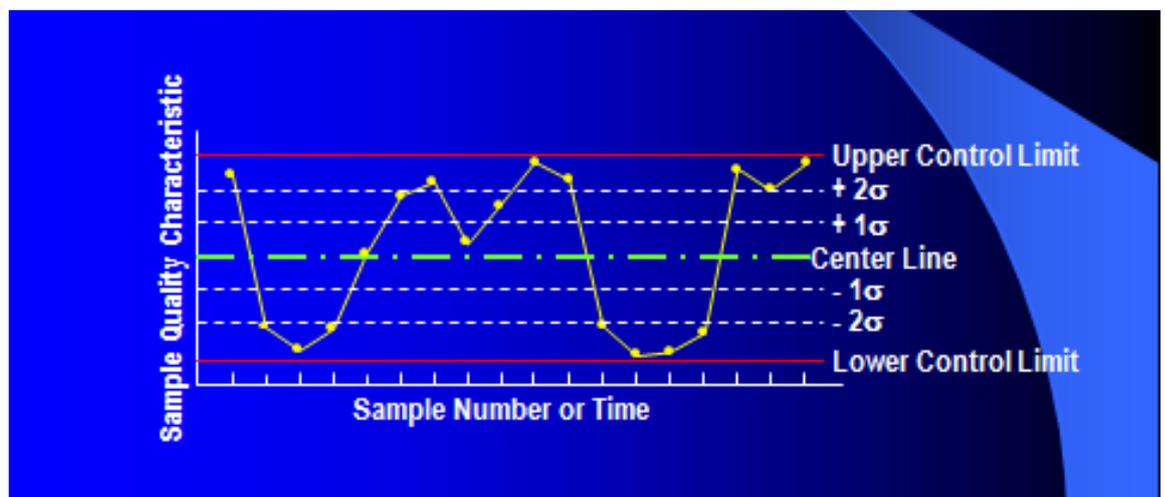


**Figure 2.5 Appearance of “stratification” instability.**

#### Common Causes of “Stratification”

- a) incorrect calculation of control limits
- b) sampling process collects one or more units from different underlying distributions within each subgroup

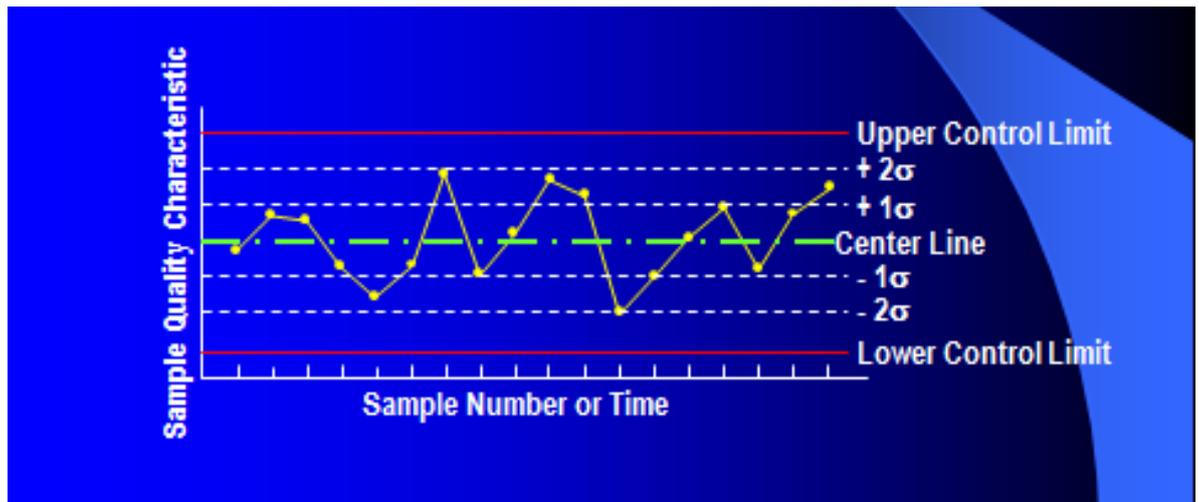
- 4) “mixture” instability.
  - points “hugging” the control limits.



**Figure 2.6 Appearance of “mixture” instability.**

### Common Causes of “Mixture”

- a) two (or more) overlapping distributions
- b) over-control by operators
- 5) “periodicity” instability.
- any ongoing, repeating pattern.



**Figure 2.7 Appearance of “periodicity” instability.**

### Common Causes of “Cycle” or “Periodicity”

- a) systematic environmental changes.
  - temperature
  - operator fatigue
  - rotation of operators
  - fluctuation in machine settings
- b) maintenance schedules.
- c) tool wear.

### 2.4 Evaluating the capability of process.

We sometimes talk about Process Capability and define it as the “six sigma” ( $6\delta$ ) spread. In such a context, we might say, “My process is capable of less than three thousandths of an inch.” We’re saying that the process spread is less than three thousandths of an inch, and presumably, that means our standard

deviation is less than one sixth of that, or half a thousandths of an inch. But that number doesn't mean much to us until we put it in the context of the requirements. If the tolerance spread is only one thousandths of an inch, our process isn't so capable after all, is it?

But if our tolerance spread is ten thousandths of an inch, then maybe it is capable. So, at least in the terms of Quality and Manufacturing, the term "Process Capability" means the ability of the process spread to fit within the tolerance spread. But how well does the  $6\delta$  spread of the process fit within the tolerance spread? Which of two processes is better? For the comparison of two or more processes, we'll need some kind of index number to help us compare "apples to apples."

$P_p$  = Process Performance. A simple and straightforward indicator of process performance.

$P_{pk}$  = Process Performance Index. Adjustment of  $P_p$  for the effect of non-centered distribution.

$C_p$  = Process Capability. A simple and straightforward indicator of process capability.

$C_{pk}$  = Process Capability Index. Adjustment of  $C_p$  for the effect of non-centered distribution.

### Basic Capability Indices of $P_p$ and $P_{pk}$

For the  $P_p$  index we take a sampling (30, 50, 100, 300, whatever your customer requires) from the process, measure the characteristic in question, and calculate the average and standard deviation using the standard formulas. If we review our basic understanding of the normal distribution, we'll remember that the average plus and minus three standard deviations will account for 99.73% of the entire population as long as the population is normally distributed. We can calculate it by using following formula:

$$P_p = \frac{UCL - LCL}{6\sigma_T} \quad (2.6)$$

So, six standard deviations (the width of  $\pm 3\delta$ ) will essentially represent all of the product. For the Pp index, we simply want to see how well this  $6\delta$  spread could fit into the tolerance spread. Let's suppose our tolerance is  $\pm 5$  units and ours is 1 unit. (We're keeping the math easy here!) The tolerance spread is thus 10 and the process spread is thus 6. So if we divide the tolerance by the process,  $10/6$  we get 1.67 Pp.

Since the process spread is the denominator in this equation, we can easily see that any number greater than one is "good" and any number less than 1 is "poor." So a 1.67 says that our process fits into the tolerance one and two thirds times, which might make most of our customers quite happy. (Your customer may require an index greater than 1.00, 1.33, or 1.67 or even 2.00, so be sure to check with them to determine the requirements for your parts).

But is the process "centered" in the tolerance zone? Since there is more of the population closer to the average in the normal distribution, it is important to have the average in the middle of the tolerance to minimize potential discrepant measurements. The formula for the Pp index does not consider this in any way. In fact, in theory, you could have a good Pp and run 100% scrap. Think of this index as the "potential" capability of the process. This means that if we can center the process in the tolerance zone perfectly, it will achieve the quality represented by the Pp index.

The Ppk index is a little more complex than the Pp because of its need to evaluate centering of the process. The best way to think of it is to divide the normal distribution in half at the average, leaving you with one curve representing the 50% of the population above the average and another for the 50% below the average.

$$P_{pk} = \frac{UCL - \bar{X}}{3\hat{\sigma}_T} \quad (2.7) \quad \text{or} \quad P_{pk} = \frac{\bar{X} - LCL}{3\hat{\sigma}_T} \quad (2.8)$$

So each of these “half curves” is  $3\delta$  wide and bounded on one side by the average. Now, we take that half curve and compare it to the limit of the tolerance with which it should be associated. In other words, the “bottom” half, or lower 50% half curve should be compared to the “bottom” limit or lower specification limit (LSL).

Let’s look at this in detail. For our example, we’ll go back to the case where the tolerance is a nominal value, say 10, with a  $\pm 5$  tolerance, meaning the tolerance zone is from 5 to 15. The process has a standard deviation of 1. So  $3\delta$  is equal to 3. But because we want to take into account how well our process is centered, we need to compare the average of our process to its location within our tolerance range.

The best way to do this is to find the distance our average is from the specification limit by subtracting the lower limit from the average. Thus, in our example, if the average is 10 (right on target), and the lower spec limit (LSL) is 5, then our tolerance width for comparison purposes is  $(10-5) = 5$ , and so our  $5/3$  still equals 1.67 capability index. So in a “perfectly centered” process, the Ppk index will produce the same value as the Pp index.

But let’s say the process drifts to where the average is now at 9 instead of 10. Our formula now becomes  $(9-5) = 4$ , so now  $4/3 = 1.33$ , and so our index number is reduced to reflect the non-centered process. If the average was 8, we’d get  $(8-5) = 3$  and  $3/3 = 1.00$  index, and if the average was 7, we’d get  $(7-5) = 2$  and  $2/3 = 0.67$  index, etc.

You might have noticed that the index will drop to zero when the average and the tolerance limit are the same. (So a Ppk of 0.00 essentially means 50% scrap.) It’s also possible for the index value to go negative if and when the average is outside the tolerance zone.

And what about the upper half of our index? It works the same, but we subtract the actual average from the Upper Spec Limit (USL) this time and divide by 3 standard deviations. As the average gets lower, it moves farther away from

the Upper Specification Limit, and thus the upper limit index would get larger with each shift while the lower limit index gets smaller.

### The Cp and Cpk indices

But there is another thing about our process for which we have not yet taken into account: whether or not our process is stable. Obviously, if our process was stable, meaning it will stay at this same average and standard deviation for a reasonable period, then we can trust it to stay at the 1.67 capability index for a longer period of time. If it has been proven extremely stable, we might even be happy with a lower index number because we'd have greater confidence in it remaining good. We can calculate them by using following formulas:

$$C_p = \frac{UCL - LCL}{6\hat{\sigma}_I} \quad (2.9) \quad \text{And} \quad c_{pk} = (1 - k) \times c_p \quad (2.10)$$

But remember how we got our data, we simply grabbed a bunch of parts and measured them. We only know that it represented the process at that time. We can think of the Pp/Ppk as a “snapshot” of the process capability at a given moment. Therefore, to think of the Pp and Ppk indices as the “short term” capability indices. They represents the capability of the process today, but we have no idea whether tomorrow's Ppk index will be the same as today's.

If we want to know the capability of a process over the long term, we'd like to know how stable that process is, right? And what is the “classic” test for stability? The Control Chart. So, if we have a control chart to encourage and demonstrate the stability of our process, and use the data from that control chart to determine our average and standard deviation, we will probably have an even better idea of the capability of our process over the “long haul.”

We will also have the capability index Cp/Cpk instead of Pp/Ppk, but the calculation and meaning of the resulting number is the same. That is to say, the calculation of the index is the same. The real difference is how we calculate the standard deviation.

For Pp/Ppk, we calculated the standard deviation the old fashioned way, by finding the squares of the deviations from the average, summing them, then dividing by the samples size minus one, and finally finding the square root of the answer. In other words, the usual mathematical definition for the standard deviation.

But when you have Control Chart data, you use the average Range to estimate the standard deviation by dividing it by the “d2” constant factor. So the only difference mathematically between the Cp/Cpk and the Pp/Ppk is how you estimate the standard deviation, and since neither can be considered the "true" standard deviation, they might differ slightly from each other.

Many people consider the Pp and Cp indices the “potential” capability of the process and the Ppk and Cpk the “performance” capability indices. So the Pp would be the “short term, potential capability index” and the Cpk would be the “long term, performance capability index.” That being the case, why does anyone use the Ppk index anymore?

The answer is sometimes we simply do not have the time required to use the Cpk index. On a new production part, during the initial phases of production, you have yet to get the control chart established enough to enforce stability and you certainly don't have enough evidence to prove stability if you can claim it. Thus, the only choice you have is the Ppk index based upon the small sample you have at this time. In other words: cost is the reason to use Ppk.

# Chapter III

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<i>Done by</i>	<i>Nishonov V.H</i>							
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<i>Advice.</i>						<i>Leaf</i>	<i>Leaves</i>	
						<i>AndMBI "MB" Fac. gr. 091-12 MSMQP</i>		
<i>Confirm.</i>								

## **CHAPTER III. QUALITY CONTROL OF THE SPARE PARTS THAT ARE PRODUCED IN “UZ DONG WON CO” FOR “SPARK” AND “GENTRA” AUTOMOBILES AND OPTIMIZATION OF MATERIAL EXPENDITURE.**

### **3.1 The manufacturing and quality control system of “Uz Dong Won Co”.**

Automotive industry that is rapidly developing in Uzbekistan provokes to establish the plants which provides with spare parts of cars. It is reported that automobile includes more than 20 000 spare parts and each parts has got an intrinsic functions. For example function of exhaust system is that to muffle the high voice and to underbid the degree of heat energy, to through the waste gas. And exhaust system is the main industrial productions of “Uz Dong Won Co”. company was found on December 27, 1996 year according to Decree No.462 of the Ministry of the Republic of Uzbekistan.

The authorized capital makes 2 106 million sum. Structure of founders :

- SC “Uzavtosanoat” – 40,7%;
- JS “ARZ-6” – 9,3%;
- “Daewoo Motor Co.” – 26%;
- “Dongwon Metal Co., Ltd.” – 24%.

“Uz Dong Won Co” begun to produce the exhaust system and panel parts for Nexia, Damas and Tico for “Uz DAEWOO avto” in 1997, December 4. After that they have begun to produce the door impact beam and catalytic converters for Matiz since 2012, Spark since November, 2010 and Lacetti since August, 2013.

June 1996 – signed an agreement for foundation of Close Stock Company JV “Uz Dong Won Co” between association of automobile manufacturing companies of Uzbekistan “Uzavtosanoat” and the corporation “Daewoo”.

May 1996 – Decree of the Cabinet of Ministers № 462 on the establishment of the Close Stock Company JV “Uz Dong Won Co”.

January-April 1997 – preparation of the project of reconstruction of the production plant of JV “Uz Dong Won Co” Preparation for the conclusion of contracts.

April 1997 – beginning of work on the reconstruction of the assembly shop JV “Uz Dong Won Co”.

September 1997 – Installation and setup of production equipment.

May 1997 – finishing reconstruction of the production plant of JV “Uz Dong Won Co”.

May 1997 – opening of the plant JV “Uz Dong Won Co”.

April 1998 – development and production of exhaust systems, Door Impact Beams, Panel Parts, Bar Asm I/P Tie for the vehicle, which are produced in the plant CJSC “GM-Uzbekistan”.

May 2011 – development and production of exhaust systems and Bar Asm I/P Tie for the vehicle M300 (Spark) CJSC «GM Uzbekistan”.

July 2012 – Development and production of exhaust systems for the vehicle “Nexia1, 6L” (Euro IV) and M300 MCE (Spark) CJSC “GM Uzbekistan”.

March 2014 – beginning of production of sport equipment and other sustaining goods.

#### Quality Policy of “Uz Dong Won Co”.

Our main goal is to provide our Customers with the highest quality products and short-time delivery. Using modern technology to become the best supplier among the suppliers of our Customers. Exceeding our Customers’ increasing expectations and produce competitive products by applying efficient Quality Management System.

To achieve this goal we will:

- comply with applicable laws, regulations and Customer requirements;
- not accept, not build and not ship defects;
- produce quality work the first time;
- put yourself in the consumer’s shoes;
- be standards compliance for manufacturing;

- follow safety rules at workplace;
- make a decision based on facts;
- we will continuously improve of production process;
- increase professional knowledge and skills.

To achieve the goals and objectives, leadership is committed to:

- a) create healthy work environment for employees;
- b) ensure their safety;
- c) provide all the necessary resources;
- d) solve all problems efficiently and in a timely;
- e) ensure efficient execution of all decisions;
- f) periodically reviewing this policy so that it remains relevant and communicating it to all concerned.

The schedule of measure instruments to check the measurements and producing products:

**Table 3.1 Measure instruments and their characteristics.**

Name, model and implement number	Name of measurement	Producer	Technic definition (interval of measure, accuracy class) mm
Shtangenreysmus NHDS – H60C № 03006103	Clarify geometric measure	Company Mitutoyo (Japan)	(0~600)±0.03
Electron shtangensyrkul CD – 20CPX №11219072	Clarify geometric measure	Company Mitutoyo (Japan)	(0~200)±0.02
Stereo microscope SZ61TR	Clarify the joint of weld	Olympus Optical (Japan)	0.67X-4.5X







The stationary welding machine fixed in 2000 in "Uz Dong Won CO" has been being used till now. Below the technic reference and structure of machine are given:

Stationary spot welding machine.

Entering tension:	380B 1 f
The speed of tension:	50 Hz
The exit power:	100 k Vt
The entering power :	286 k Vt
The maximal power of:	1000 kg c/sm <sup>2</sup>
The series №:	3108/07
Model:	ASP-100
Work sycle:	6,1%
The maximal exit of electricity :	26000 A
Demonstrating of steam power:	8 l/min
Date of production:	2000. 2.



**Figure 3.3. Appearance of stationary spot welding machine.**

There is pipe cutting machine fixed in 1997 that cuts pipes in certain length, in joint-venture. There are three machines like this in the enterprise. Below, the technic reference and structure of machine are given:

### Pipe Cutting

Date of fix:	1997 and 2008.
Tension of power chain:	3 F 380V, 50 Hz
Pressure of pressed air:	1F 110 V, 50 Hz
Siqilgan havo bosimi:	5 kg c/sm <sup>2</sup>
Control process:	Logical control operation (P.L.C)



**Figure 3.4 Appearance of pipe cutting.**

Action model of pipe bending machine (ЧПТ).

Type :	MC-80R, № BO 390A & BO 391A
Date of production:	1997 and 2008
Power :	50 k Vt
Phase :	3 f
Speed of tension:	50/60 Hz
Tension :	200 V
Dimension of machine:	4700 (length) 1800 (width) 1460 (height)



**Figure 3.5 Appearance of action model of pipe bending machine (ЧПТ).**

Machine for model of pipe.

Tension of power interaction:	~ 380 V 50 Hz
Tension of control interaction:	~ 220 V 50 Hz
Logical control operation:	MOJ2 (GOLDSTAR)
Hydraulic part :	VICKER, LOTTE
Maximal pressure:	140 kg/sm <sup>2</sup>

Fixed pressure:	70 kg/sm <sup>2</sup> (manometric sign)
Motor power:	15HP x 6P
Storage of water tank:	300 liter
Gidravlic oil:	ISO №46.0 CONCT=40 °C
Gidravlic cylindr:	f 200x100 (power: 17.812 -70 kg/m <sup>2</sup> )
Producer :	DAE YOUNG ENGINEERING CO. Korea

#### Circular saw machine.

Circular speed of saw:	32 R.P.M
Diameter of cutting part:	350 mm
The main motor:	380 V, 1.5 k Vt, 3 F, 50 Hz
Circular speed of saw:	0-26.5 mm/sec
Storage of water tank:	35 liter
Motor of cooling process:	0.1 k Vt
Motor of water pump:	380 V, 1.5 K Vt, 3 F, 50 Hz
Dimension :	1040(L)* 1260(W)* 1800(H)
Weight:	550 kg



**Figure 3.6 Appearance of circular saw machine.**

Auto welding machine in CO<sub>2</sub> condition.

Entering tension:	3 F ; 380 V; 50 Hz
Tension in control cycle:	DC 24 V
Control process:	logical control; program (PLC)
Medium pressure:	5 kg\sm <sup>2</sup>
System :	electronic dvigatel and pnevmatic cylindr
Motor :	(GEARED MOTOR) G3L-28-100 040 NISSEY
Weld changer:	AUTO TACRU 350
Weld burners:	F-35L
Giving machinery:	M-CA350



**Figure 3.7 Appearance of auto welding machine in CO<sub>2</sub> condition.**

22 auto welding machines working in CO<sub>2</sub> condition are used in enterprises (three of them are in line of “Matiz”).

1997 y (18 one-way, line “Nexia”, “Tico”, “Damas”);

2001 y (3 one-way, line “Matiz”);

2010 y (3 one-way, line “M-300”);

2013 y (6 one-way, line “J- 200”).

### Manual welding machine in CO<sub>2</sub> condition.

Entering tension:	3 F ; 380 V; 50 Hz
Medium pressure:	5 kg\sm <sup>2</sup>
System :	pnevmatic cylindr
Weld changer:	AUTO TACRU 350
Weld burners:	F-35L
Giving machinery:	M-CA350



**Figure 3.8 Appearance of manual welding machine in CO<sub>2</sub> condition.**

19 manual welding machines working in CO<sub>2</sub> condition are used in enterprises (an eleven of them are in line of “Matiz”).

- № UzDN 035; 40; 46; 45; 50 (5 one in a line “Nexia”, “Tico”, “Damas”) 1997 y
- № UzDN 065; 66; 67 (3 one in a line “Damas” MEMBER) 1998 y
- № UzDN-Mz 04; 05; 09; 10; 11; 13 (6 one in a line “Matiz”)
- № UzDN-Mz 14; 15; 16; 17 (4 one in a line “Matiz” IMPACT BEAM) 2002 y
- № UzDN-Mz 20 (1 one in a line “Matiz” TIE BAR) 2003 y

## Machine for checking the muffler.

This machinery is used for checking the compactness of exit process.

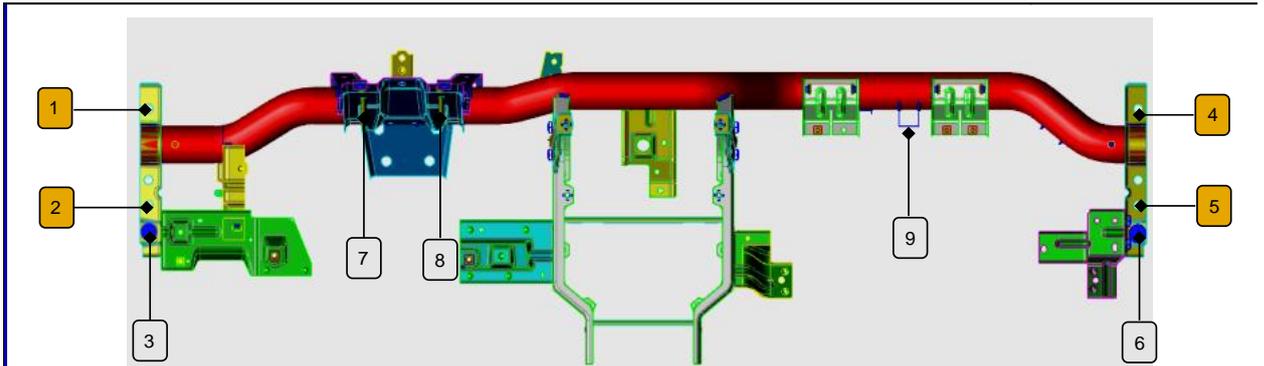
Power interaction of electricity:	~ 380V; F1; 50 Hz; 0,5 k Vt
Way of control:	logical control, operation (PLC)
Pressure of pressed air:	4.5 kg/sm <sup>2</sup>
Dimension of machine (mm):	2300 (length) 1400 (width) 2000 (height)
Series №:	V-23-07 (96570729)
Date of production:	2009.
Date of fix:	2010.
Producer :	DONGWON PRECISION IND. CO., LTD. Chongnam, Korea



**Figure 3.9 Appearance of machine for checking the muffler.**

### 3.2 Quality control of TIE BAR for J200 (GENTRA).

In my practical work I am going to control quality of seventh points of TIE BAR for J200 (GENTRA) by using X and R chart and it is given in following picture:



**Figure 3.10 Appearance of TIE BAR for J200 (GENTRA).**

In there I have to measure length of seventh points of TIE BAR for J200 (GENTRA). According to the standards of TIE BAR for J200 (GENTRA), its Upper Control Limit(UCL) is 4,00 sm, Central Limit is 3,00 sm and Lower Control Limit is 2,00. That's why I chose electronshtangensyrkul as an measurement device.



**Figure 3.11 Electron shtangensyrkul.**

In order to build the X and R chart, length of seventh points of TIE BAR for J200 (GENTRA) was measured 5 times in a day and results of measurement was collected during the month. They are given in the table 3.2.

**Table 3.2 Results of measurement.**

Date	2-31 May																				
Sample	2	3	4	5	6	10	11	12	13	16	17	18	19	20	23	24	26	27	30	31	
Sample	X1	3,80	5,00	3,70	3,40	2,90	3,40	3,40	3,80	3,40	4,10	3,80	4,00	3,8	3,8	3,0	3,0	2,8	3,0	3,3	3,5
	X2	3,80	4,80	4,40	3,50	2,80	3,50	4,40	3,60	3,50	4,00	4,00	3,70	3,7	4,0	3,2	2,8	2,5	2,8	3,5	3,8
	X3	3,80	3,80	3,70	3,30	3,50	3,50	3,50	4,20	4,30	3,80	3,90	3,90	4,0	3,9	3,0	3,2	2,5	3,2	4,0	4,0
	X4	3,80	3,70	4,40	3,30	3,20	3,40	3,50	4,10	3,80	4,00	4,10	3,70	3,0	3,6	3,9	3,5	2,8	3,5	3,7	3,5
	X5	3,80	3,50	3,70	3,40	3,20	3,50	3,80	3,60	3,40	3,90	4,30	3,60	3,2	3,5	3,0	3,8	3,0	3,5	3,8	3,5

Secondly, for daily results  $\bar{X}$  (AVERAGE) and  $R$  (RANGE) was calculated. For example for May 3 they were calculated like this:

$$\bar{X} = \frac{X_1 + X_2 + X_3 + X_4 + X_5}{5} = \frac{5,00 + 4,80 + 3,80 + 3,70 + 3,50}{5} = 4,16$$

$$R = R_{max} - R_{min} = 5,00 - 3,50 = 1,50$$

In this way table 3.3 was filled.

**Table 3.3 Results of calculation for  $\bar{X}$  and  $R$ .**

Date	2-31 May																				
Sample	2	3	4	5	6	10	11	12	13	16	17	18	19	20	23	24	26	27	30	31	
Sample	X1	3,80	5,00	3,70	3,40	2,90	3,40	3,40	3,80	3,40	4,10	3,80	4,00	3,8	3,8	3,0	3,0	2,8	3,0	3,3	3,5
	X2	3,80	4,80	4,40	3,50	2,80	3,50	4,40	3,60	3,50	4,00	4,00	3,70	3,7	4,0	3,2	2,8	2,5	2,8	3,5	3,8
	X3	3,80	3,80	3,70	3,30	3,50	3,50	3,50	4,20	4,30	3,80	3,90	3,90	4,0	3,9	3,0	3,2	2,5	3,2	4,0	4,0
	X4	3,80	3,70	4,40	3,30	3,20	3,40	3,50	4,10	3,80	4,00	4,10	3,70	3,0	3,6	3,9	3,5	2,8	3,5	3,7	3,5
	X5	3,80	3,50	3,70	3,40	3,20	3,50	3,80	3,60	3,40	3,90	4,30	3,60	3,2	3,5	3,0	3,8	3,0	3,5	3,8	3,5
$\bar{X}$ (AVERAGE)	3,80	4,16	3,98	3,38	3,12	3,46	3,72	3,86	3,68	3,96	4,02	3,78	3,54	3,76	3,22	3,26	2,72	3,20	3,66	3,66	
R (RANGE)	0,00	1,50	0,70	0,20	0,70	0,10	1,00	0,60	0,90	0,30	0,50	0,40	1,00	0,50	0,90	1,00	0,50	0,70	0,70	0,50	

Thirdly, central limit ( $\bar{X}$ ,  $\bar{R}$ ), upper control limit (UCL) and lower control limit (LCL) for X and R chart were found by using following method:

$$1) \bar{\bar{X}} = \frac{\sum \bar{X}}{k} = \frac{71,94}{20} = 3,597$$

$$2) \bar{R} = \frac{\sum R}{k} = \frac{12,7}{20} = 0,635$$

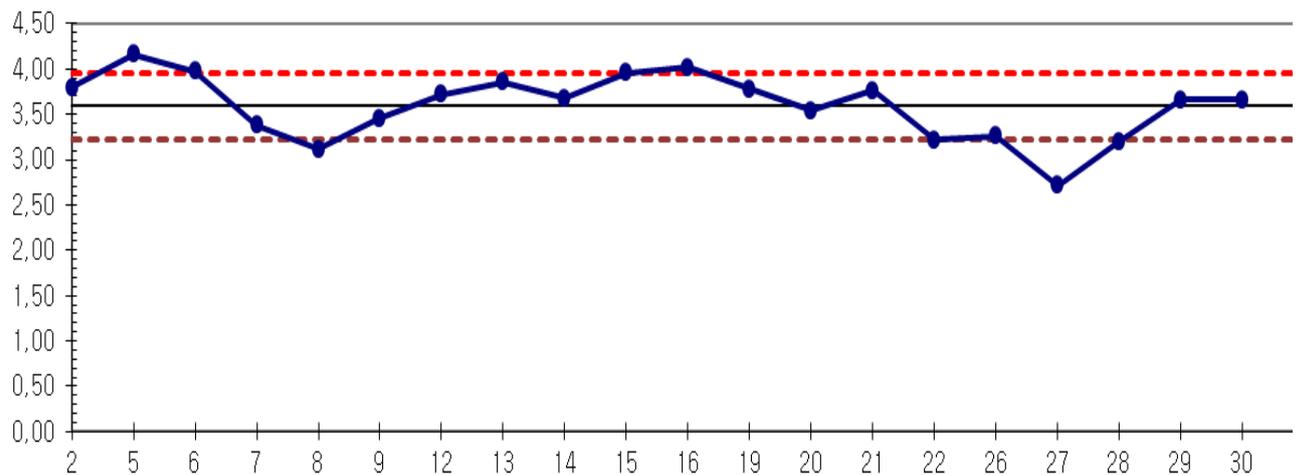
$$3) UCL = \bar{\bar{X}} + A_2 \bar{R} = 3,597 + 0,577 \times 0,635 = 3,963$$

$$4) LCL = \bar{\bar{X}} - A_2 \bar{R} = 3,597 - 0,577 \times 0,635 = 3,231$$

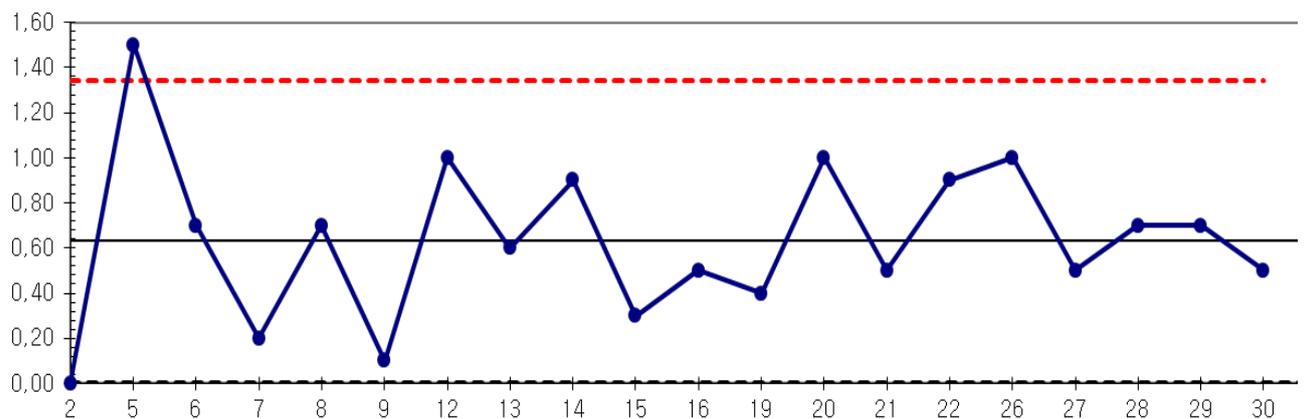
$$5) UCL_R = D_4 \times \bar{R} = 2,115 \times 0,635 = 1,343$$

$$6) LCL_R = D_3 \times \bar{R} = 0 \times 0,635 = 0$$

Where,  $D_3$ ,  $D_4$  and  $A_2$  were taken from table.



**Figure 3.12 X control chart.**



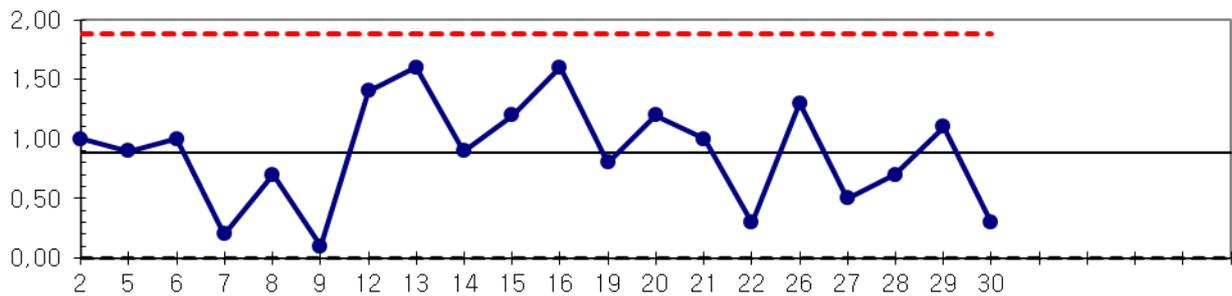
**Figure 3.13 R control chart.**

Finally, process capability was found.

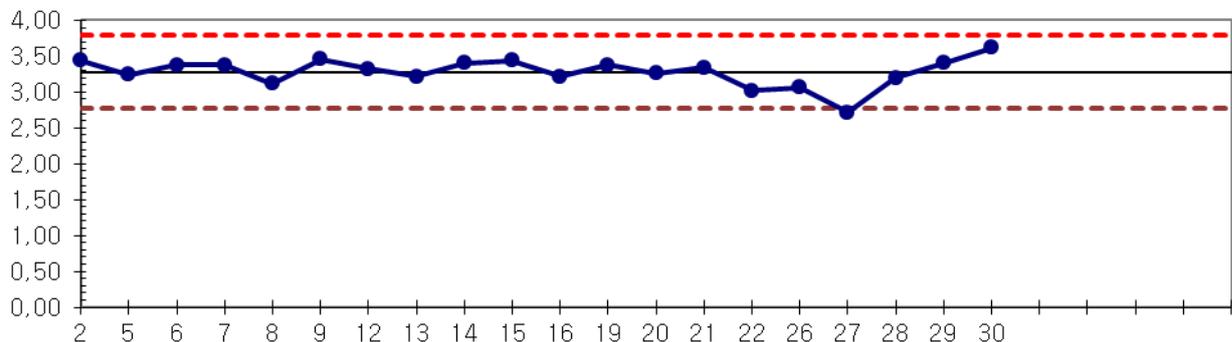
$$\delta = \frac{\bar{R}}{d_2} = \frac{0,635}{3,778} = 0,168$$

$$C_p = \frac{UCL - LCL}{6 \times \delta} = \frac{3,963 - 3,231}{6 \times 0,168} = 0,726$$

Here,  $C_p \leq 1$  that's why process capability could not be accepted and also 1 point is beyond  $\pm 3\sigma$  limits. As a result process was relearnt, new workers, methods, raw materials or machines were checked, inspection methods or standards were changed, skill or motivation of operators were strengthened. After that X and R control chart was calculated for new month and it showed good results in quality control for seventh points of TIE BAR for J200 (GENTRA).



**Figure 3.14 R control chart after the correction.**



**Figure 3.15 X control chart after the correction.**

### **3.3 Optimization of material expenditure for spare parts of “Spark” and “Gentra” automobiles.**

The concept of optimization is basic to much of what we do in our daily lives: a desire to do better or be the best in one field or another. In engineering we wish to produce the best possible result with the available resources. In a highly competitive modern world it is no longer sufficient to design a system whose performance of the required task is just satisfactory. It is essential to design the best system. Thus in “designing” new products in any field: aerospace, automotive, chemical, electrical, biomedical, agricultural, etc, we must use design tools which provide the desired results in a timely and economical fashion. Numerical optimization is one of the tools at our disposal.

Optimization is a very general automated design technique. In studying this technique it is important to distinguish between analysis and design. Analysis is the process of determining the response of the specified system to the certain combination of input parameters. For example, calculation stresses in the structure as a result of certain loads. Design on the other hand, means the process of defining a system. For example, designing a structure would mean selecting specific dimensions and location of the structural members that will allow the structure to withstand the specified load.

Much of the design task in engineering is quantifiable, and so we are able to use computers to analyse alternative designs rapidly. The purpose of numerical optimization is to aid us in rationally searching among alternative designs for the best design to meet our needs.

The alternative designs of the same system differ from each other because some parameters of the system are not the same. The parameters that could be changed in the system while searching for the best design are called design variables. Although we may not always think of it this way, design process may be defined as the process of finding the minimum or maximum of some characteristic, which may be called the objective function. For the design to be acceptable it must

also satisfy certain requirements. These requirements are called design constraints. Optimization automatically changes the design variables to help us find the minimum or maximum of the objective function, while satisfying all the required design constraints.

Below optimization of material expenditure for spare parts of “Spark” and “Gentra” automobiles is given:

**Table 3.3 Consumption norm of auxiliary materials in welding shop for “Spark” and “Gentra” before optimization.**

№	Part № / № детали	Part name / Наименование детали	Consumption rate / Норма расхода		
			Wire / Сварочная проволока, kg	Antirust paint / Антикоррозийная краска, kg	Thinner / Растворитель, kg
<b>GENTRA (J200)</b>					
1	95076046	Передняя выхлопная труба	0,123	0,00620	0,00032
2	95076047	Передняя выхлопная труба	0,123	0,00620	0,00032
3	95076048	Передняя выхлопная труба	0,106	0,00524	0,0003
4	95076049	Передняя выхлопная труба	0,106	0,00524	0,0003
5	96556591	Передняя глушитель	0,071	0,00347	0,0002
6	96556593	Передняя глушитель	0,071	0,00347	0,0002
7	96553619	Задний глушитель	0,065	0,00280	0,00016
8	96553624	Задний глушитель	0,063	0,00280	0,00016
9	96434739	Полоса скрепления	0,08	-	-
10	96433408	Полоса скрепления	0,08	-	-
<b>ИТОГО</b>			<b>0,888</b>	<b>0,03542</b>	<b>0,00196</b>
Part name / Наименование детали					
<b>ИТОГО</b>			<b>#ССЫЛКА!</b>	<b>#ССЫЛКА!</b>	<b>#ССЫЛКА!</b>
<b>SPARK (M300)</b>					
1	95467984	BAR ASM - I/P TIE	0,13	-	-
2	95467986	BAR ASM - I/P TIE	0,13	-	-
3	95467987	BAR ASM - I/P TIE	0,13	-	-
4	94565091	MUFFLER ASM - EXH	0,06	0,0024	0,0001
5	96819219	MUFFLER ASM - EXH	0,06	0,0024	0,0001
6	94565089	MUFFLER ASM - EXH	0,06	0,0024	0,0001
7	96819217	MUFFLER ASM - EXH	0,06	0,0024	0,0001
8	96962869	MUFFLER ASM - EXH	0,073	0.0033	0,0003
9	96819218	MUFFLER ASM - EXH	0,073	0.0033	0,0003
10	96962868	MUFFLER ASM - EXH	0,073	0.0033	0,0003
11	96819216	MUFFLER ASM - EXH	0,073	0.0033	0,0003
12	94579210	MUFFLER ASM - EXH	0,073	0.0033	0,0003
13	96819284	MUFFLER ASM - EXH	0,073	0.0033	0,0003
14	94579487	RR MUFFLER ASM, [B12D, 2Y]	0,04	0,0022	0,0001
15	94579484	RR MUFFLER ASM, [B12D, 3Y]	0,04	0,0022	0,0001
16	96910457	FRT MUFFLER ASM, [B12D, 2Y]	0,071	0.0033	0,0003
17	94579478	FRT MUFFLER ASM, [B12D, 3Y]	0,071	0.0033	0,0003
<b>ИТОГО</b>			<b>1,29</b>	<b>0,0140</b>	<b>0,0031</b>

**Table 3.4 Consumption norm of auxiliary materials in welding shop for “Spark” and “Gentra” after optimization.**

№	Part № / № детали	Part name / Наименование детали	Consumption rate / Норма расхода		
			Wire / Сварочная проволока, kg	Antirust paint / Антикоррозийная краска, kg	Thinner / Растворитель, kg
<b>GENTRA (J200)</b>					
1	95076046	Передняя выхлопная труба	0,119	0,00615	0,00032
2	95076047	Передняя выхлопная труба	0,119	0,00615	0,00032
3	95076048	Передняя выхлопная труба	0,105	0,00521	0,00027
4	95076049	Передняя выхлопная труба	0,105	0,00521	0,00027
5	96556591	Передняя глушитель	0,071	0,00347	0,00018
6	96556593	Передняя глушитель	0,071	0,00347	0,00018
7	96553619	Задний глушитель	0,063	0,00278	0,00014
8	96553624	Задний глушитель	0,063	0,00278	0,00014
9	96434739	Полоса скрепления	0,08	-	-
10	96433408	Полоса скрепления	0,08	-	-
<b>ИТОГО</b>			<b>0,876</b>	<b>0,03522</b>	<b>0,00182</b>
Part name / Наименование детали					
<b>ИТОГО</b>			<b>#ССЫЛКА!</b>	<b>#ССЫЛКА!</b>	<b>#ССЫЛКА!</b>
<b>SPARK (M300)</b>					
1	95467984	BAR ASM - I/P TIE	0,11	-	-
2	95467986	BAR ASM - I/P TIE	0,11	-	-
3	95467987	BAR ASM - I/P TIE	0,11	-	-
4	94565091	MUFFLER ASM - EXH	0,04	0,0022	0,0001
5	96819219	MUFFLER ASM - EXH	0,04	0,0022	0,0001
6	94565089	MUFFLER ASM - EXH	0,04	0,0022	0,0001
7	96819217	MUFFLER ASM - EXH	0,04	0,0022	0,0001
8	96962869	MUFFLER ASM - EXH	0,071	0,0030	0,0002
9	96819218	MUFFLER ASM - EXH	0,071	0,0030	0,0002
10	96962868	MUFFLER ASM - EXH	0,071	0,0030	0,0002
11	96819216	MUFFLER ASM - EXH	0,071	0,0030	0,0002
12	94579210	MUFFLER ASM - EXH	0,071	0,0030	0,0002
13	96819284	MUFFLER ASM - EXH	0,071	0,0030	0,0002
14	94579487	RR MUFFLER ASM, [B12D, 2Y]	0,04	0,0022	0,0001
15	94579484	RR MUFFLER ASM, [B12D, 3Y]	0,04	0,0022	0,0001
16	96910457	FRT MUFFLER ASM, [B12D, 2Y]	0,071	0,0030	0,0002
17	94579478	FRT MUFFLER ASM, [B12D, 3Y]	0,071	0,0030	0,0002
<b>ИТОГО</b>			<b>1,138</b>	<b>0,0372</b>	<b>0,0019</b>

The results of optimization indicates The tolerance of the welding wire to 2%; tolerance anticorrosion paint to 3.5%; tolerance solvent to 3.5%.

# Life safety

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<i>Mea</i>	<i>List</i>	<i>Document №</i>	<i>Sign</i>	<i>Date</i>				
<i>Done by</i>	<i>Nishonov V.H</i>							
<i>Supervisor.</i>	<i>Qosimov B.</i>							
<i>Head of CH</i>	<i>Esonova Sh</i>					<i>Leaf</i>	<i>Leaves</i>	
<i>Advice.</i>								
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## LIFE SAFETY

Automobile parts manufacturer Labour enclosure.

To improve the working conditions for the production and the creation of healthy and safe working conditions first on improving the protection of labour requires a planned development activities. This plan should be drawn up in coordination with the activities of the Committee of Trade Unions, and should be provided with the necessary resources. All work carried out work to improve the protection of a one-year, five-year and planned for the future based on a comprehensive plan.

Work is planned to be concluded on a one-year plan to improve the protection measures with the administration of the organization of the trade union committee on the protection of labour between the community finds its reflection in the contract. At the beginning of the project team contract workers be allowed only in the general meeting and three disapproved by the trade-union committee and administration of the organization.

Concluded work on improving the protection of activities includes the following sections:

A) The prevention of accidents in the manufacturing:

- All new construction of facilities covers issues of labour protection and safety production work with the project;
- Accidents more unique events for analysis;
- New equipment and to ensure safe working conditions and the means of production.



Figure 1. "Uz Dong Won Co" prevention devices.



Figure 2. “Uz Dong Won Co” medical service

B) The prevention of disease in the manufacturing:

- To ensure the normal places of work and recreation rooms microclimate;
- Employers and employees to work and from work by bus or automobile equipped for this purpose;
- The organization of medical examination of the types of work.

C) Working conditions:

- The production of culture, the introduction of new technologies and new production technologies;
- The organization of competitions aimed at improving the status of the safety equipment.

G) labour protection and safety training , as well as other promotion works:

- All the workers and the safety engineer and technical personnel training, guidance and knowledge testing ;
- Safety equipment and emergency life safety cabinets .

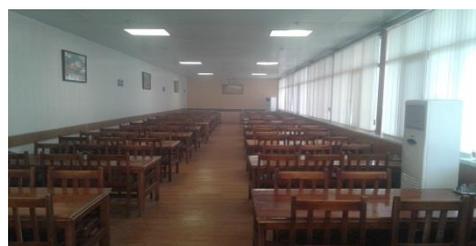


Figure 3. Created comforts in “Uz Dong Won Co”.

## Labour protection and safety training.

Operating in the production of cars, each attached to the worker and the worker must be able to secure a profound knowledge of the case. For them labour protection and safety, professional training is required.

Production of light vehicle production shop for all workers, regardless of the level of security and the nature of the work of all security training, after they inspected knowledge. Factory workers labour protection and safety training and instructions are carried out through them.

Instructions in accordance with the instructions, the primary instructions in the workplace, the next router, the router extraordinary, divided into periodic guidelines. Employees held all the instructions and courses taught, and then the employees will be given a certificate.

Special workshop production of clothing, personal protective equipment and its prevention. The Republic of Uzbekistan, "The code of labour laws" and "Labour protection" laws on working conditions hazardous activities, as well as the specific conditions of temperature measured performance of employees working in the works of pollutants or special clothes, special footwear and other personal protective equipment for free.

The company or the administration of special clothing, special footwear and other personal protective equipment, washing, cleaning and repair, and for ongoing monitoring of the use of these tools as well as you need to go.

Light vehicle production shop such conditions have been fully established and controlled by the persons responsible. In addition, the pollution associated with the values specified in cases worker free soap and other means harmless.

Terms of the use of special clothing and personal protective equipment is installed, as follows: robes, shoes 12 months, the gloves 1 or 2 months, Cascade, 2 years, 36 months warm clothes.

Take into account accident research and production.

The territory of the Republic of Uzbekistan of all enterprises and organizations, as well as some of the work of the labour contract labour in

connection with the activities they have experienced health staff and other contamination control and accounting - 286 of the Cabinet of Ministers on June 6, 1997 - carried out according to the approved resolution.

This system: the judgment of the court during the running production of serving the citizens, employers, contractors and assignments by persons performing work on civil legal agreements, natural and man-made nature to citizens participating in the elimination of emergency situations, the plant implementation of practical training for students and pupils. Natural death, self-murder, intentional damage to the health of the victim, as well as investigating the circumstances of the injury to the victim during the commission of a crime and are not taken into account.

The employer no later than 3 days after the end of the check to the victim or the person who defended the interests of his state, or other acceptable language issued in an accident on the N-1 form must act.

Between the employer and the state technical inspector bewilderment chief state inspector. Accidents investigated:

- At the same time for more than two employees had accidents, fatal accidents, the consequences of severe accidents;

- The end of the node with the group of death and serious accidents must be reported immediately in accordance with the scheme of the employer: state technical inspector, the higher authorities.

If you have an accident, a member of the Council of the Federation of Trade Unions organization occurs, the trade communities chief technical inspector is part of the commission.

Accidents for more than five people were killed by the Commission based on the decision of the Cabinet of Ministers of the Republic of Uzbekistan.

A special control commission within 15 days after an accident verify the status of the company's labour protection. If necessary, and other enterprises in the industry, is organized by a special inspection certificate form.

Special control measures proposed by the Commission to conduct a special

inspection on the implementation of any other state technical inspector, "O'zsanoatkontexnazorat" objects under the control of the State Committee for the local authorities to provide information in writing.

#### Main requests of technic security in welding.

Driving the welding with covered electrode in helping electric bow by hand, a lot of dust is separated, as a result the amount of gathering dust in breathing organs of welder is more than the normal. The dust consists of iron oxides and there are also the mixture of Mn, Cr, Ni, V, Mo, and the combination of elements in it.

There are gases, azote oxides, carbon oxides and sometimes fluorine oxides in Welding. The amount of manganese oxide and combination of fluorine isn't much if we compare with the amount of iron oxides, but they play main role in choosing electrodes and their sheeting because of their toxic effects. The dust contained in welding is so tiny Dimension includes 98-99% of amount of elements that are smaller than 1 m km, as a result it gives them a chance to enter the lung issue; the breathing organs hold 60-70% the dust contained in electric welding. The temperature of welding bow is quite high near to 6000 C, that is why, It is considered as a source of ray energy that is in a diapason from (infra-red) to (ultra-violet) radiation. Automatic and half-automatic welding under fluting improve working condition of welder because the bow lights under the fluting layer and protect eyesight from harmful effects further more, it prevents from being by the drops of metal, on the other hand working process become the formulation automatic welding. However, air condition of producing rooms becomes with the dust of gases and fluting. In this condition especially the steams from fluorine combination in fluting is so dangerous. Little amount of dust and waste produce in welding by hand with non meeting electrode and inert gases. In welding condition dust gases, ozone oxides, carbon oxides, oxides are produced. Defense gases compress oxygen from air, if the amount of oxygen in our degree from 15% (for example working in closed or bad air contained rooms). Being poisoned may

happen the most dangerous poisons are manganese and carbon oxides to the health of welder. There may be extra danger in welding special steels with chromium nickel-electrodes. It depends on producing chromium and nickel oxides, zinc oxides are produced in welding galvanized steels.

Much amount of gases and dust (ozone, nitrogen oxides, oxides of material elements being welded) are separated from welding with thawing and non-thawing electrode by helping argon bow. The most dangerous gases ozone O<sub>3</sub>, the ting amount of this gas may cause the poisoning it can appear by the effects of electric ranks (ultra-violent) radiation and high temperature of bow.

Electric welding aerosol and manganese oxides are not separated from welding with non-electrode in argon condition. From the gases that are used in preparing constructions and installing, Helium gathers at the top of the closed room because of being the lightest gas, Argon and carbon oxides gather in the low part of the room because of being the most heavy gases, nitrogen spreads along the rooms.

Gathering carbon oxides, azote oxides, acetylene and inflammable gases in the rooms is related to welding metals with gas. All in flammable gases may mix with oxygen and air, even there may be any kind of mixture that can be burst by a tiny spark. For example: acetylene is so dangerous to burst by mixing air. (there is 21% .....82% acetylene in air structure). And when acetylene is more than 2.3% in oxygen mixture it is dangerous.

When compressed oxygen is affected by oily substance and firm fuels standing in tiny disperse condition, their being oxides happens suddenly, in burn itself. This condition causes a lot of damages such as burning people, fire and even explosion. In welding with bow, radiation (visible, ultra-violent, infra-red rays) is so dangerous to cause many job diseases; ultra-violent is the most dangerous radiation, it course eye diseases namely electro ophthalmic.

In welding, too loud voices, trembling and ultra voices are also more dangerous. The welders usually have to work in uncomfortable and to living

condition of body, moreover, workshop compresses the action of welder. Especially working condition in a closed space is too hard.

Job diseases and being poisoned of welders are Pneuma, poisoning with manganese and strongly poisoning with welding gases. In order to prevent these diseases, health and fitness measures must be hold: the most hygienic ways of welding and using welding materials having less poison, ventilating, working less in closed places, follow hygienic working routine and using personal instruments of protection.

Breaking the rules technic security in welding may cause:

1. To be damaged of electricity and electric bow by ultra-violent and heat rays.
2. To be damaged of exploding of balloons seduction gear, rainpol.
3. To be damaged of eyes from cleaning Sturm burners wooden from trash and metal drops.
4. To poison with poisonous dust and gases as well as defense and inflammable gases.
5. To burning from melted metal and taking catch fire of thaws.
6. To getting coal from doing installation work of welder in winter.

There is no any safe way of welding. For example: there is a danger of being radiated by X-ray rays in welding with electron-ray and ultra voice in welding with ultra voice and may be damaged in compressing electrode during contact welding, and strong magnet arena may impact in magnetic welding. Main danger in welding with burst is related to using explosives.

# The economic part

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<i>MeaList</i>	<i>Document №</i>	<i>Sign</i>	<i>Date</i>					
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<i>Advice.</i>					<i>Leaf</i>	<i>Leaves</i>		
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## THE ECONOMIC PART

The economic essence of the quality costs.

The product quality requirements are set taking into account the available processes , personnel , resources, and finance. These requirements critically determine the cost of manufacture and maintenance, and hence the price. Moreover, if the consumer is offered a "new" quality, the price can be substantially higher than the cost of production .

1. With regard to quality financial management is usually considered from the standpoint of reducing the quality costs. For the collection, recording and analysis of information on the cost of the quality necessary to classify in detail the types and choose their measured performance.

2. When talking about quality management, usually have in mind the quality of production, based on the need to reduce defects in the manufacturing process and minimize failures when using consumer products. Therefore, usually to the cost of quality include:

- In the event costs and processes aimed at preventing non-conformities (defects, errors) in their implementation;
- The costs of quality control in all its forms;
- Costs associated with the financial losses from discrepancies as in release (internal loss), and using (operating) products (external loss). The most important significance for the cost - to create quality, to achieve the desired quality of the project. Since it is difficult to name the processes (production and service), from which a greater or lesser degree depend on the quality of products, all costs associated with the creation and implementation of these processes are the costs of quality. Especially important are the development costs - marketing, design, collection of information on requests and customer satisfaction in the process equipment.

3. Costs for the creation of quality (the development of new materials, finding new design and technological solutions, testing and debugging of new products, and so on) Should be carefully considered and analysed, but does not

save them. Because they are much lower than the costs that are associated with inefficient, fraught with failures and accidents exploitation. In the design of useful methods of quality control and value analysis.

You also can not save on costs related to the prevention of nonconformities (defects, errors, marriage) and the control, but these costs are optimal borders.

At the same time, losses from discrepancies should always strive to be reduced to zero.

Cost management quality requires skill, firstly, continuously collect and record information about the quality of the cost, and secondly, to analyse it. It is clear that the most expedient to carry out the collection of information and analysis of the study and optimization of processes and cost accounting on the quality built into the mechanism of financial and / or accounting.

4. The results of the analysis of the quality costs are the basis for the search of new technological and organizational solutions primarily for the prevention of nonconformities (defects, errors) and improving control, especially as the cost of the appearance of inconsistencies in the use or operation of the stage many times the cost of their removal in the production and, especially, to prevent their occurrence.

5. The results of the analysis of the costs of quality are also the basis for the planning of production costs and adoption of on investments in production decisions. New quality - these are new materials, a new design, new technologies, new design principles, etc. All this requires significant investments in the design and production on the background of the existing costs of quality.

The decision on the most profitable investment of funds to improve the quality has a fundamental decision in quality management and quality management, respectively the main principle - the principle of maximum efficiency of investment in quality.

Naturally, to assess the effectiveness of investment should be given and the expected price of new products, and the expected competitiveness, sales volume,

payback periods, advertising costs and mandatory confirmation of product safety procedures, and if money is taken in debt, term of the loan and interest.

Particularly relevant principle of maximum efficiency of investments in the quality of Russian manufacturers - buy a license or do their own development, to invest in production equipment to replace imported or replace obsolete equipment. Failure decision to throw it from the market because the money to try again, as a rule, no. This once again confirms the need for very careful and balanced assessment when making decisions about ways to improve the quality and scope of investments, with a serious analysis of the options, a comprehensive study of the market, both Russian and foreign.

#### Classification of quality costs.

Market relations require implementation in practice of international rules of accounting, business analysis and reporting. The international standards for quality system notes the importance of evaluating the effectiveness of the quality system from a financial point of view. An effective quality system may have a very important impact on the profitability of the organization, especially at the expense of improving economic activity, which leads not only to a decrease in marriage and the cost of manufacturing the product, but also to reduce the costs associated with the use and operation of the product.

Overall classification of costs shown in Table 1.

Costs of quality - a cost that must be incurred to provide customer satisfaction products. There are several classifications of the quality costs.

**Table 1. Classification of costs.**

Symptom classification	Classification group of costs
1. On the target appointment of	<ul style="list-style-type: none"> <li>- Improving quality;</li> <li>- To ensure quality;</li> <li>- On the quality of management</li> </ul>
2. Economic the nature of costs	<ul style="list-style-type: none"> <li>- Current;</li> <li>- lump sum</li> </ul>
3. According to the type of costs	<ul style="list-style-type: none"> <li>- Productive, unproductive</li> </ul>
4. Method definition	<ul style="list-style-type: none"> <li>- Straight, slanting</li> </ul>
5. Opportunity accounting	<ul style="list-style-type: none"> <li>- Measurable direct integration;</li> <li>- Are not directly account;</li> <li>- Which is not economically feasible to consider</li> </ul>
6. With respect to the production Process	<ul style="list-style-type: none"> <li>- The quality in primary production;</li> <li>- The quality of the production in the secondary;</li> <li>- On the quality of the service production</li> </ul>
7. Opportunity evaluation	<ul style="list-style-type: none"> <li>- Planned;</li> <li>- Actual</li> </ul>
8. The nature structuring	<ul style="list-style-type: none"> <li>- On the enterprise;</li> <li>- The production (workshop, site);</li> <li>- By product</li> </ul>
9. On the objects forming and accounting	<ul style="list-style-type: none"> <li>- Products;</li> <li>- Processes;</li> <li>- Services</li> </ul>
10. According to the type of accounting	<ul style="list-style-type: none"> <li>- Operational, analytical, accounting, target</li> </ul>

The quality management theory, there are two basic approaches to the cost of quality:

1. A. Feigenbaum;
2. School F. Crosby.

The most famous of them - an approach Juran Feigenbaum, in accordance with this approach, costs are divided into four categories:

- 1) on preventive measures cost - to prevent the very possibility of defects, for example, costs to reduce or completely prevent the possibility of defects or losses;
- 2) cost control - the determination and confirmation of the achieved level of quality;
- 3) internal losses (internal costs) - costs incurred within the organization;
- 4) external losses (cost of external defects) - expenses incurred outside organization (for example, after the product has been sold to the consumer). When the planned quality level is reached. The sum of all these costs gives the overall cost of quality.

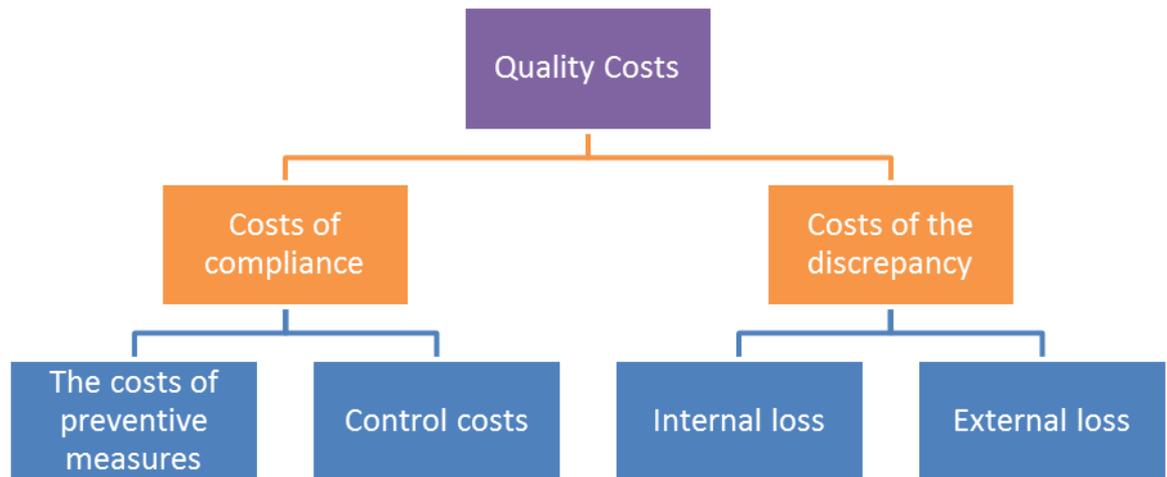
Another classification of expenses for the quality offered F. Krosbi (Figure 5), which shared the cost of quality into two categories:

- 1) the cost of compliance - all costs to be incurred to make it right the first time;
- 2) expenses for the discrepancy - all costs that have to be due to the fact that not everything is done right the first time.

It can be assumed that the first two groups of costs, calculated by the method of Juran Feigenbaum - "the costs of preventive measures" and "cost control" correspond to the category "the cost of compliance", calculated according to the method of Crosby. These costs can not be reduced to zero, as it does not assess the quality and not to carry out preventive measures is to put the quality of their course.

"External loss" and "internal loss" correspond to the "cost of non-compliant", since the marriage, found within the firm or consumer - is in any case

of loss, for which to pay. These costs can and should do as little as possible, and ideally - to bring to zero.



**Figure 1. Classification of quality costs.**

In domestic treatment costs associated with product quality are:

- costs of maintenance and guarantee an adequate level of product quality;
- costs associated with losses in the event of failure to reach a proper level

of quality.

During the development, the development of production and direct production of new products formed the so-called core costs, much of which reflects the cost value of the various factors of production, as well as overhead and general expenses attributable to the production of products through an estimate of the costs and additional costs due to product improvement and restoration of quality products to the proper level in the event of failure to reach.

One of the additional cost items are the cost of quality assessment, including in its membership:

- on controlling labor costs;
- costs of special test equipment;

- overhead costs of technical control or the quality of the service department;
- costs of information in the field of trade;
- costs of organizing and carrying out sample surveys consumers' opinions about the quality of their products.

Market relations require implementation in practice of international rules of accounting, business analysis. In principle, this information can be divided into external (financial) and internal (management).

The international standards on quality management system indicates that the costs associated with quality, are calculated within organization criteria. In doing so, the costs associated with quality, include costs incurred in ensuring and guaranteeing a satisfactory quality, including in its cultivation, as well as expenses resulting from losses due to poor quality; some losses can be difficult to quantify, but they can be very important (for example, company prestige loss).

#### Methods for calculating the quality costs.

International standards for the purpose of uniformity, comparability and generalization of the economic information, give advice only some costing methods for the quality of the external (financial) statements about the activities of the manufacturer as part of the quality system.

1. The method of calculating the cost of quality concerns the definition of the Costs of Quality (ЗК= затрат на качество), which are generally divided into the costs arising from Internal Economic Activity (Ву=внутренней затраты) and External Works (Вш= внешние затраты). The components of the costs of internal economic activity, are analyzed on the basis of the costing model under: Prevention (П= профилактика), Assessment (О= оценивание), Defects (Д = дефекты).

The costs of prevention and evaluation are considered to be a profitable investment, then the costs of defects - a loss.

By constituting the costs include the following:

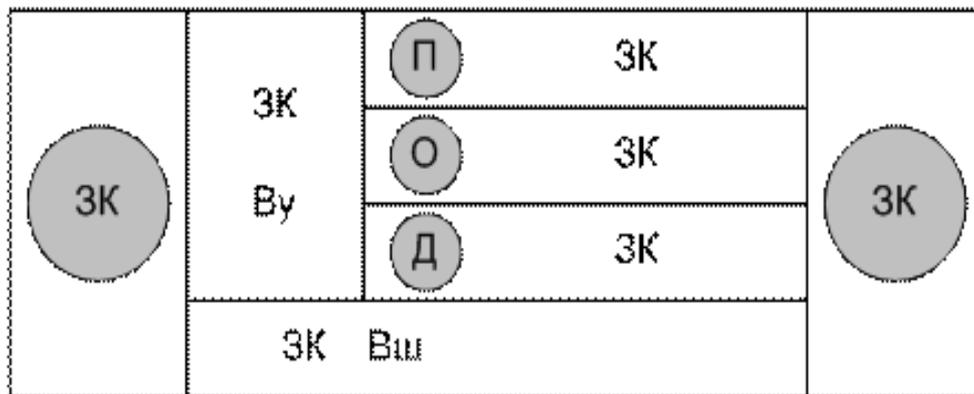
Prevention - activities to prevent defects (training, metrology support, etc.).

Evaluation - testing, monitoring and inspection to assess compliance with the quality requirements;

Internal costs (By), which are the result of defects arising prior to the delivery of products due to the fact that the products do not meet quality requirements (for example, alteration, re-processing, marriage, re-testing, etc.);

External costs (BIII) as a result of the defects that have arisen as a result of the delivery of products that do not meet the quality requirements (for example, maintenance and repair of products, warranties and returns, discounts and direct costs associated with the withdrawal of products, and others.).

Classification of quality costs to a method, shown in Figure 2.



**Figure 2. Classification of quality costs to a method.**

2. The method of calculation of the costs associated with the processes.

It uses the concept of costs of compliance and non-compliance of any process, both of which can be a source of savings. Under the cost of compliance mean the costs incurred to meet all the requests (generated or implied) of consumers with existing process reliability. Under the cost discrepancy understand costs in violation of the existing process.

3. Method for determining losses due to poor quality.

It focuses on internal and external losses due to poor quality and the definition of tangible and intangible losses. It includes a reduction in future sales volume due to the dissatisfaction of consumers external material losses. Internal

intangible losses - the result of loss of productivity due to rework, missed opportunities, poor ergonomics, etc. Losses of material - Is the internal and external costs resulting from defects.

### The impact of quality on economic performance

The effectiveness of activities of scientific and technological progress is taken as a characteristic of the system capable of producing economic benefits  $\mathcal{E}$  (экономический эффект) equal to the difference between the economic performance of  $P$  (результатов экономической деятельности) and  $Z$  (затраты) costs:

$$\mathcal{E} = P - Z$$

In my diploma project economic performance ( $P$ ) and costs ( $Z_1$ ) of TIE BAR for J200 (GENTRA) was 8500 and 6800 sum respectively before using the X and R control chart. And according to the formula economic benefits ( $\mathcal{E}_1$ ) of TIE BAR for J200 (GENTRA) was calculated like this:

$$\mathcal{E}_1 = P - Z_1 = 8500 - 6800 = 1700 \text{ sum}$$

After using X and R control chart for quality control of TIE BAR for J200 (GENTRA) costs ( $Z_2$ ) was decreased to the 6562 sum according to the results of optimization 3,5 %. And economic benefits ( $\mathcal{E}_2$ ) showed followings:

$$\mathcal{E}_2 = P - Z_2 = 8500 - 6562 = 1938 \text{ sum}$$

And there economic benefits of quality control was calculated like this:

$$\varphi = Z_2 - \mathcal{E}_1 = 1938 - 1700 = 238 \text{ sum}$$

In the “Uz Dong Won Co” 200 pieces TIE BAR for J200 (GENTRA) is produced in a day. If we calculate it monthly (or 24 weekdays), it would be 4800. Hence in a month enterprise may find 1142 400 sum benefit if they can implement optimization successfully.

# Conclusion

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					<b>Conclusion</b>	<i>List</i>		<i>Weight</i>	<i>Zoom.</i>
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<i>Supervisor.</i>	<i>Qosimov B.</i>								
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<i>Advice.</i>						<i>Leaf</i>		<i>Leaves</i>	
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## CONCLUSION

The increasing globalization and market competition had made it necessary for manufacturing companies in Uzbekistan to improve their effectiveness. This new and challenging environment has motivated much senior management in manufacturing companies to re-evaluate their competitive strategies and management practices with the aim of improving organizational performance in the area of quality. Quality Control (QC) is a management philosophy that integrates strategy, management practices and organizational outcomes to create a quality organization that improve continuously and sustain performance. The SPC (Statistical Process Control)'s role in QC, as a contributor to continuous improvement and its use as a reliability tool are reviewed.

In this diploma project quality control and optimization of material expenditure in mass automotive production were discussed as an one of the most worldwide issues of today's.

According to the goals of diploma project , advantages of X and R control charts were analyzed in order to improve effectiveness of quality control for spare parts of "Spark" and "Gentra" automobiles. And below they are given:

1. Dramatically reduce variability and scrap.
2. Scientifically improve productivity.
3. Reduce costs.
4. Uncover hidden process personalities.
5. Instant reaction to process changes.
6. Enable the process perform constantly and predictably.
7. Provide a common language for discussing the performance of the process (capability indices).

Be used by employees for on-going control of process.

# Literature

					<b>5310900 MSMQP</b>			
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<i>Confirm.</i>					<i>AndMBI "MB" Fac. gr. 091-12 MSMQP</i>			

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## APPENDIX

### Appendix 1. Standart values

Number of sample, k	Coefitsent											Coefitsent for central line			
	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	B <sub>3</sub>	B <sub>4</sub>	B <sub>5</sub>	B <sub>6</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	C <sub>4</sub>	1/ C <sub>4</sub>	d <sub>2</sub>	1/ d <sub>2</sub>
2.	2,121	1,880	2,659	0,000	3,267	0,000	2,606	0,000	3,686	0,000	3,267	0,797	1,2533	1,1280	0,8865
3.	1,732	1,023	1,954	0,000	2,568	0,000	2,276	0,000	4,358	0,000	2,574	0,888	1,1284	1,6930	0,5907
4.	1,500	0,729	1,628	0,000	2,266	0,000	2,088	0,000	4,696	0,000	2,282	0,921	1,0854	2,0590	0,4857
5.	1,342	0,577	1,427	0,000	2,089	0,000	1,964	0,000	4,918	0,000	2,114	0,940	1,0638	2,3260	0,4299
6.	1,225	0,483	1,287	0,030	1,970	0,029	1,874	0,000	5,078	0,000	2,004	0,951	1,0510	2,5340	0,3946
7.	1,134	0,419	1,182	0,118	1,882	0,113	1,806	0,204	5,204	0,076	1,924	0,959	1,0423	2,7040	0,3698
8.	1,061	0,373	1,099	0,185	1,815	0,179	1,751	0,388	5,306	0,136	1,864	0,965	1,0363	2,8470	0,3512
9.	1,000	0,337	1,032	0,239	1,761	0,232	1,707	0,547	5,393	0,184	1,816	0,969	1,0317	2,9700	0,3367
10.	0,949	0,308	0,975	0,284	1,716	0,276	1,669	0,687	5,469	0,223	1,777	0,972	1,0281	3,0780	0,3249
11.	0,905	0,285	0,927	0,321	1,679	0,313	1,637	0,811	5,535	0,256	1,744	0,975	1,0252	3,1730	0,3152
12.	0,866	0,266	0,886	0,354	1,646	0,346	1,610	0,922	5,594	0,283	1,717	0,977	1,0229	3,2580	0,3069
13.	0,832	0,249	0,850	0,382	1,618	0,374	1,585	1,025	5,647	0,307	1,693	0,979	1,0210	3,3360	0,2998
14.	0,802	0,235	0,817	0,406	1,594	0,399	1,563	1,118	5,696	0,328	1,672	0,981	1,0194	3,4070	0,2935
15.	0,775	0,223	0,789	0,428	1,572	0,421	1,544	1,203	5,741	0,347	1,653	0,982	1,0180	3,4720	0,2880
16.	0,750	0,212	0,763	0,448	1,552	0,440	1,526	1,282	5,782	0,363	1,637	0,983	1,0168	3,5320	0,2831
17.	0,728	0,203	0,739	0,466	1,534	0,458	1,511	1,356	5,820	0,378	1,622	0,984	1,0157	3,5880	0,2784
18.	0,707	0,194	0,718	0,482	1,518	0,475	1,496	1,424	5,856	0,391	1,608	0,985	1,0148	3,6400	0,2747
19.	0,688	0,187	0,698	0,497	1,503	0,490	1,483	1,487	5,891	0,403	1,597	0,986	1,0140	3,6890	0,2711
20.	0,671	0,180	0,680	0,510	1,490	0,504	1,470	1,549	5,921	0,415	1,585	0,986	1,0133	3,7350	0,2677
21.	0,655	0,173	0,663	0,523	1,477	0,516	1,459	1,605	5,951	0,425	1,575	0,987	1,0126	3,7780	0,2647
22.	0,640	0,167	0,647	0,534	1,466	0,528	1,448	1,659	5,979	0,434	1,566	0,988	1,0119	3,8190	0,2618
23.	0,626	0,162	0,633	0,545	1,455	0,539	1,438	1,710	6,006	0,443	1,557	0,988	1,0114	3,8580	0,2592
24.	0,612	0,157	0,619	0,555	1,445	0,549	1,429	1,759	6,031	0,451	1,548	0,989	1,0109	3,8950	0,2567
25.	0,600	0,153	0,606	0,565	1,434	0,559	1,420	1,806	6,056	0,459	1,541	0,989	1,0105	3,9310	0,2544

Note – Source – ASTM, Philadelphia, PA, USA