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Research Paper

Special Conditions Designing a Development Model for Optimizing the Production of Gasoline Products in the Oil Refinery in Spring and Summer

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Abstract

The purpose of this research is to design a model for the development of optimization of gasoline production in the oil refinery. The research method is experimental, which uses nonlinear programming. The statistical population is the set of sections and pressures of steam, benzene, octane in four different time periods for the production of gasoline products in accordance with the standards of the National Petroleum Products Distribution Company. Version 24.1.2 resolved. The results of determining the amount of slices for mixing in two time periods, the amount of steam pressure, octane and benzene to produce the final gasoline product for each of the nine slices in each time period are shown.. An increase in the amount of benzene in the gasoline product than the standard level causes an increase in the amount of air pollution. On the other hand, reducing the octane number will increase the knocking of car engines and will lead to a decrease in engine efficiency. Exceeding the standard gasoline steam pressure reduces the volume of gasoline consumed by customers and as a result creates customer dissatisfaction.

Keywords *Production, Gasoline Product, Oil Refinery, Octane Number, Stean Pressure, Benzen*

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Introduction

The compounds of living organisms are buried under sedimentary rocks and are subjected to heat and pressure, turning them into fossil fuels. There are many types of crude oil around the world. Crude oil is converted into products with different characteristics with the help of distillation process and in the temperature range of -165 degrees Celsius to +750 degrees Celsius. The distillation process esteamates the components with the lower boiling point and thus the less volatile components remain, thus separating the material. By combining the separated materials under process conditions, products such as gasoline are produced (Shankar et al., 2019). The dramatic increase in the consumption of various fossil fuels, especially gasoline, during the last decade in the country, has caused the need for a long-term planning to use the appropriate fuel as an alternative to gasoline more than before. Especially when we know that the average fuel consumption in the country's transportation sector is much higher than the global average consumption and this difference is increasing day by day. Due to the increase in fuel prices in world markets and consequently the increase in gasoline prices, every year a large part of the budget that should be spent on creating various industrial and economic infrastructure of the country, it is used to cover the costs of importing gasoline and paying subsidies. In addition, the high emissions of gasoline-burning vehicles inflict irreparable damage on the country's environment, especially in large cities. To the extent that experts believe that the medical costs of these pollutions in the long run are much higher than the annual cost of gasoline for cars. Due to the growth of gasoline consumption in recent years and the continuous increase in its imports and also increase its price globally, if the full supply of consumer demand deficit, according to existing growth through imports is done and assuming current prices stabilize, (Equivalent to the difference between the cost of purchasing imported gasoline and its domestic sales revenue to consumers at approved prices), this year's foreign exchange needs to subsidize imported gasoline are estimated at $ 6 billion. Providing it will put a lot of pressure on the country's revenue sources (National Iranian Oil Company, Fuel Consumption Optimization Organization, 2008). In today's world, energy is one of the most important factors in economic growth and development and due to the importance of its role in production and service costs, as well as environmental issues, much attention is paid to improving the consumption situation and efficiency in its use. Among these, the transportation sector is one of the largest consumers of energy and also the main consumer of petroleum products in which the growth of consumption is increasing (Jahangard, 2010). Reduction of energy consumption is faced with optimization of operational parameters (Kolivand Saluki et al., 2018). Because gasoline is derived from crude oil, it also blends with petroleum fragments. Gasoline sold on the market today must meet the requirements of modern engines and environmental regulations and standards. With the rapid adaptation of cars at the beginning of the twentieth century, gasoline consumption also increased rapidly. Initially, gasoline cars had low-compression engines. As a result, light naphtha or regular gasoline was suitable for burning in those engines. But car factories moved quickly and on demand to produce high-powered engines. The increase in power was directly related to the increase in the number of cylinders in the engine. Another way to increase power was to compress the engines. As engine density increased, regular gasoline burned out of time, and in addition to generating less power, it also reduced performance due to effect damage to the engine. To eliminate the effect and fix the mentioned problems, the burning of ordinary gasoline had to be delayed and the solution was to combine gasoline with octane boosters. One of the octane boosters was lead. Other octane enhancement processes include catalytic failure, alkylation, and isomerization. While octane is a characteristic that is constant throughout the year, the steam pressure of the gasoline composition varies at 37 ° C throughout the year. In summer, when the temperature reaches more than 37 degrees Celsius, the gasoline steam pressure should be less than 14.7psi. Otherwise, the gasoline steam pressure created in the car tank will be a problem. Therefore, the steam pressure of the gasoline composition within a permissible range must be observed and therefore, the mixing of gasoline composition depends on the steam pressure of the various compounds present in the manufacture of the gasoline product. The EPA is an organization that controls emissions and other characteristics of gasoline pollutants. The organization banned the use of octane boosters such as lead and aromatics, and required automakers to control the esteamation system. It also required the use of oxygenated compounds such as MTBE to reduce the amount of carbon monoxide. In 2005, the use of MTBE was banned due to infiltration from underground tanks and contamination of aquifers, and was replaced by ethanol. However, due to the high solubility of ethanol with water, it could not be used in oil refineries and shipped via pipelines and only had to be used in oil terminals (Cristian & et al). Different operating units cannot produce the final products directly. They produce intermediate components or products or semi-intermediate products and mix them together to produce products with the desired specifications.

Background

Babazadeh and Pashazadeh (2017) in their research on the subject of optimal planning for the production, distribution and storage of gasoline from the refinery to consumption points, they presented a mixed integer mathematical model for planning and developing the gasoline supply chain network in Iran. They did not include the important steam pressure variable in their model. Beigi et al. (2017) in their research on the optimization of catalytic failure unit, in order to improve the quality and increase gasoline production while reducing unit pollution, by examining the effect of input variables of catalytic failure process on gasoline quality and unit pollution, they designed a model. In their model, they considered only operational constraints such as temperature and current intensity. While gasoline steam pressure is also an important variable. Daniel & et al (2019) in his research on measuring and predicting oxygen steam pressure of gasoline concluded that the steam pressure of a gasoline product usually indicates non-ideal behavior and requires up-to-date measurements and forecasting tools to ensure the safety and performance characteristics of the fuel. S Salem et al. (2018) in their study on the genetic effects of occupational exposure to benzene in pump-gasoline workers concluded that benzene is one of the most dangerous components in the gasoline product, which is in the first category of human cancer aggravating substances. Xiaoyong & et al (2017) in their research on the method of decomposition of a decision tree for oil refinery planning using a decomposition method, they designed a model for optimizing refining fuels. The structure of the decision tree is based on important inputs, including the rate of conversion of crude oil into products, the amount of demand and quality of products, and output on several classes, and on the type of investment of the oil refinery. The output of the decision tree is connected to a series of mathematical sub-models that depend on the input variables of the decision tree. Weaknesses of the model can be: 1. not considering seasonal changes 2. Not considering repairs and emergency conditions of operational units. 3. Not using other cuts in special conditions and in making gasoline. Christie &Yu Yang (2017) used an intelligent method for optimization in their design on the scenario-based approach to controlling and optimizing the intelligent system. In their method, optimization constraints can be changed within an allowable range and so the optimization is intelligently controlled. However, the important characteristic of benzene in the production of gasoline products must also be considered. Guoxi & et al (2016) in their research on refinery optimization and product planning based on downstream needs concluded that disconnect between optimizing the production system of products and the market demand creates problems for producers. Existing methods model only part of a refinery or market demand, and by combining the two, researchers not only reduce additional manpower costs and waste of resources, they are also economically viable. They used three simplex methods, PSO nonlinear method and numerical method to optimize the relationship between upstream flows of production, products and market. They used the ethyl 70 model for octane gasoline. Also, for gasoline pressure, only one season of the year was considered. An oil refinery usually buys crude oil from several different sources with different compositions and characteristics and at different prices; and then from this crude oil by various processes, it produces various products such as gasoline, gas oil and aircraft fuel in different quantities. However, considering that in Iran it is not possible to buy crude oil for refineries from different sources, optimizing the conditions is only through production processes and mixing different products. The purpose of economic optimization is to find an area with the highest economic value (Niknam et al., 2017). The best example of this is engine gasoline. Production of this product is becoming more complex as the number of properties to be controlled in its specifications is increasing. In this research, the user focuses on presenting a model for the optimal development of gasoline production in one of the Tehran oil refineries, taking into account the determination of octane number as well as the change of seasons. As a result, changes in gasoline steam pressure are intended to answer this question "How is the gasoline production model in the oil refinery designed in the spring and summer?"

Method

Benzene is a colorless, fragrant and volatile liquid that burns with a yellow flame with soot. And in industrial production, a group of materials such as polystyrene, synthetic rubber and nylon are used. This liquid is also used in the preparation of detergents and colors. Benzene belongs to the family of hydrocarbons, each molecule of which has 6 carbon atoms and 6 hydrogen atoms. Which create a circular arrangement. This arrangement is called the benzene ring that it is also present in many compounds, including aspirin and the more explosive nitro-toluene. Benzene is toxic and carcinogenic. Adding gasoline to gasoline increases the octane number of gasoline and reduces the chance of engine crash. For this reason, until the 1950s, most gasoline contained several percent benzene, but then tetraethyl lead became more common than benzene. The obsolescence of leaded gasoline has led to the return of gasoline to gasoline in some countries. However, due to the negative effects of this substance on health, strict regulations have been imposed on the amount of benzene, which is usually limited to less than one percent.

Octane number: It is a scale to show the resistance of gasoline or other fuels against heat, pressure and spontaneous combustion (without spark). Isoctane (2, 2, 4-trimethyl pentane) is given the number 100 and normal heptane is given the number zero. The octane number of gasoline is the percentage of isooctane in normal heptane that has anti-knock properties equal to the gasoline tested under standard test conditions. Simply put, the higher the octane number of a fuel, the more resistant it is to the destructive combustion of pressure and heat. The octane number of regular gasoline is 87 special gasoline 89 and super gasoline 93. When we say gasoline octane number is 90, it means that the fuel quality of this gasoline is equal to a mixture of 90% isooctane fuel and 10% heptane.

Steam pressure: One of the important physical properties of volatile liquids is their steam pressure, which is especially important in car and aircraft gasoline. Steam pressure is effective in moving, heating and suffocating due to the generation of steam at high operating temperatures or high altitudes. In some areas, high steam pressure for gasoline is a criterion for monitoring air pollution. The steam pressure of crude oil for transportation and its initial refining is of great importance to the producer and refiner. One of the factors for indirect measurement of the rate of esteamation of volatile petroleum solvents is their steam pressure.

After developing a nonlinear programming model to solve the mixing problem, its validity and efficiency for the current situation should be determined. Because the prepared model should be used to solve real problems and predict solutions to various other problems. If the predicted values are close to the actual values, it means that the model accurately represents the actual conditions and the current situation. Combining different oil cuts to produce gasoline products in accordance with the standards of the National Company for Distribution of Petroleum Products in one of the central oil refineries of Iran, which Has catalytic conversion units with platform products produced and a capacity of 15,000 barrels per day for each unit, de-icing unit with an isomer product with a capacity of 17,000 barrels per day, Hydrogen refining unit with a capacity of 31,000 barrels per day with wild oil product, distillation unit with heavy and light naphtha product with a capacity of 125,000 barrels per day and Isomax units with the product of Isomax light and heavy naphtha product and the capacity of each unit is 15000 barrels per day are considered. In this way, different oil sections with their specifications will be mixed in accordance with the table below which results in the optimal production of gasoline products and in accordance with standard specifications in different seasons.

Table 1

Octane Number, Steam Pressure and Benzene Content of Different Cuts

BZ (VOL %) Amount of benzene	RVP. (psi) steam pressure	Oct. No. max Octane Number Maximum	Oct. No. min Octane Number Minimum	Cut name
4	37	93	91	PLATFORMATE - 1
4	39	95	92	PLATFORMATE - 2
T	96	85	80	ISOMERATE
2/8	20	45	45	W.Naphta (KHDS)
0/4	20	40	40	H.ISO.Naphta - 1
0/7	20	40	40	H.ISO.Naphta - 2
2	75	67	67	L.S.R.G
2	66	70	70	L.Iso.Naphta
0/5	20	47	47	H.S.R.G

And the specifications of the final standard of gasoline products in spring and summer are show in table 2.

Table 2
Steam Pressure, Octane number and Benzene Gasoline in Spring and Summer

Maximum		**Minimum**		
16 June to 15 September	March 6 to June 6	16 June to 15 September	March 6 to June 6	
60	62	45	50	Steam pressure (kPa)
2	2	0	0	Volume percentage of benzene
87	87	87	87	Octane number

Octane number of cuts and final gasoline product using octane engine and ASTM D2699 standard, steam pressure of cuts and final gasoline product using gauge accessories, Air chamber and liquid chamber and standard ASTM D323 and the amount of benzene in the cuts and the final product of gasoline were extracted using G.C. machine and ASTM D5134 standard.

Production model of gasoline product mixing

Original model

Collections:

I :A set of components

J :Collections of Vapour & Pressure, Octone, Benzene

T: Collection of courses

Index:

i: Index of member elements of the collection I

j: Index of member elements of the collection J

t: Index of member elements of the collection T

parameters:

: MIN_{ijt} The lower limit of production of element j related to components i in period t

: MAX_{ijt} The upper limit of production of element j related to components i in period t

: S_j Standard value of elements j in period t

The amount of gasoline that must be produced in period t Q_t :

Variables:

Steam & Pressure value in period t $F\_vapour\ \&\ pressure_t$:

F_Octone_t :Octone value in period t

$F\_Benzene_t$: The amount of Benzene in period t

Positive variables:

The amount of production of elements j belonging to v_{ijt} : components i in period t

λ_{it} : The amount of components i used in period t

First sub-model

Collections:

I: A set of components

J: A collection of Benzene components

T: Collection of courses

Index:

i Index of member elements of the collection I

j Index of member elements of the collection J

t Index of member elements of the collection T

parameters:

of element j related to The lower limit of production MIN_{ijt} : components i in period t

The upper limit of production of element j related to MAX_{ijt} : components i in period t

S_j : Standard value of elements j in period t

The amount of gasoline that must be produced in period t Q_t :

Variables:

$F\_Benzene_t$: The amount of Benzene in period t

Positive variables:

v_{ijt} :The amount of production of elements j belonging to components i in period t

The amount of components i used in period t λ_{it} :

3-1-2-The second sub-model

Collections:

I: A set of components

J: A collection of Octone components

T: Collection of courses

Index:

i Index of member elements of the collection I

j Index of member elements of the collection J

t Index of member elements of the collection T

parameters:

of element j related to The lower limit of production MIN_{ijt} : components i in period t

The upper limit of production of element j related to MAX_{ijt} : components i in period t

: S_j Standard value of elements j in period t

Q_t : The amount of gasoline that must be produced in period t

Variables:

F_Octone_t Octone value in period t

Positive variables:

The amount of production of elements j belonging to v_{ijt} : components i in period t

The amount of components i used in period t λ_{it} :

3-1-3-Third sub-model

Collections:

I A set of components

J A collection of Vapour & Pressure components

T Collection of courses

Index:

i Index of member elements of the collection I

j Index of member elements of the collection J

t Index of member elements of the collection T

parameters:

ment j related to The lower limit of production of ele MIN_{ijt} : components i in period t

The upper limit of production of element j related to MAX_{ijt} : components i in period t

S_j : Standard value of elements j in period t

The amount of gasoline that must be produced in period t Q_t :

Variables:

$F\_vapour\ \&\ pressure_t$:Steam & Pressure value in period t

Positive variables:

The amount of production of elements j belonging to v_{ijt} : components i in period t

λ_{it} : The amount of components i used in period t

Because in this study all three variables have equal importance in the characteristics of gasoline products, when calculating the objective functions of the weighted summation method, the weights are considered equal to one. However, due to the possibility of changing the importance of specifications in the future, the weighting method has been used in this study.

Table 3
Weight of Steam Pressure Variables, Benzene and Octane Number

w_j Weights	Variables
1	$vapour\ \&\ pressure(v_{1t}):$
1	$Benzene(v_{2t}):$
1	$Octone(v_{3t}):$

Objective functions of the first model:

Relationship (1)

$$Max(F) = \sum_{j\in J}\sum_{t\in T} w_j . \sum_{j\in J} \frac{v_{ijt}.\lambda_{ijt}}{Q_t}$$

Relationship (2)

$$F\_Benzene_t = \sum_{t\in T}\sum_{i\in I} \frac{v_{i,Benzene,t}.\lambda_{i,Benzene,t}}{Q_t}$$

Limitations

(1) $\forall i \in I, j \in J, t \in T$ $\quad MIN_{ijt} \le v_{ijt} \le MAX_{ijt}$

(2) $\forall t \in T$ $\quad \sum_{i\in I} \lambda_{it} v_{ijt} = S_{jt}.Q_t$

(3) $\forall i \in I, t \in T$ $\quad \lambda_{it}.M \ge w_j . \sum_{j\in J} v_{ijt}$

Function 1 Objective of the first model: Calculates the amount of variable cuts in each period.

Function 2 Objective of the first model: calculates the amount of benzene variable in each period.

Limitation (1): Determines the upper and lower limit of element production.

Limitation (2): Determines the amount v_{ijt} based on λ_{it} and $S_{jt}.Q_t$ the amount of gasoline produced.

Limitation (3): If the value v_{ijt} then λ_{it} must be positive.

Objectives of the second model:

Relationship (1)

$$Max(F) = \sum_{j \in J} \sum_{t \in T} w_j . \sum_{j \in J} \frac{v_{ijt} . \lambda_{ijt}}{Q_t}$$

Relationship (2)

$$F\_Octone_t = \sum_{t \in T} \sum_{i \in I} \frac{v_{i,Octone,t} . \lambda_{i,Octone,t}}{Q_t}$$

Limitations

(1) $\forall i \in I, j \in J, t \in T$ $\quad MIN_{ijt} \le v_{ijt} \le MAX_{ijt}$

(2) $\forall t \in T$ $\quad \sum_{i \in I} \lambda_{it} v_{ijt} = S_{jt} . Q_t$

(3) $\forall i \in I, t \in T$ $\quad \lambda_{it} . M \ge w_j . \sum_{j \in J} v_{ijt}$

Function 1 Objective of the first model: Calculates the amount of variable cuts in each period.

Function 2 Objective of the first model: Calculates the amount of octane variables in each period.

Limitation (1): Determines the upper and lower limit of element production.

Limitation (2): Determines the amount v_{ijt} based on λ_{it} and $S_{jt}.Q_t$ the amount of gasoline produced.

Limitation (3): If the value v_{ijt} then λ_{it} must be positive.

Objectives of the third model:

Relationship (1)

$$Max(F) = \sum_{j \in J} \sum_{t \in T} w_j . \sum_{j \in J} \frac{v_{ijt} . \lambda_{ijt}}{Q_t}$$

Relationship (2)

$$F\_vapour\ \&\ perssure_t = \sum_{t\in T}\sum_{i\in I}\frac{v_{i,vapour\ \&\ pressure,t}.\lambda_{i,vapour\ \&\ pressure,t}}{Q_t}$$

Limitations

(1)	$\forall i\in I, j\in J, t\in T$	$MIN_{ijt}\le v_{ijt}\le MAX_{ijt}$
(2)	$\forall t\in T$	$\sum_{i\in I}\lambda_{it}v_{ijt} = S_{jt}.Q_t$
(3)	$\forall i\in I, t\in T$	$\lambda_{it}.M\ge w_j.\sum_{j\in J}v_{ijt}$

Function 1 Objective of the first model: Calculates the amount of variable cuts in each period.

Function 2 Objective of the first model: Calculates the variable amount of steam pressure in each period.

Limitation (1): Determines the upper and lower limit of element production.

Limitation (2): Determines the amount v_{ijt} based on λ_{it} and $S_{jt}.Q_t$ the amount of gasoline produced.

Limitation (3): If the value v_{ijt} then λ_{it} must be positive.

In this research, we are looking to design an optimization model for gasoline products in the oil refinery in spring and summer. By developing a nonlinear programming model as well as identifying international standards of effective components in the formation of the desired gasoline product, from solving the model developed in Gomez software, we were able to calculate the optimal mixing composition in spring and summer. The developed model was evaluated in two periods and Gomez software was used to solve the developed nonlinear problem. In order to accurately solve the model, Saloon Baron has been analyzed with Gomez software with version 24.1.2. Then, the values of slices obtained from Gomez software are averaged and finalized by Excel program.

Findings

In this section, we analyze the proposed model in spring and summer. For this purpose, in order to solve the problem in larger dimensions, we set the time index for two time periods and solve the problem with Gomez software with version 24.1.2. Also due to the multi-objective nature of the problem of the weighted method using weights $W\_(_{vapour\_pressure}) = 1$, $W\_{_{Benzene}} = 1$, $W\_(_{Octone\ min}) = 1$, $W\_(_{Octone\ max}) = 1$ for target functions. In the following, the numerical results obtained from solving the model in two periods are presented. Table 4 shows the optimal amount of the main variables.

Table 4

The Optimal Value of the Question Variables in Two Different Time Periods

$F_{Benzene}$	$F_{Octone\ min}$	$F_{Vapour\_pressure}$	**Question**
0/02	88	50	**Spring**
0/02	87	49	**Summer**

The figures in the table above indicate that in summer, due to hot weather, gasoline steam pressure and, by nature, the octane number has a lower value in spring. The cut-off values for the benzene target function are show in table 5.

Table 5

Objective Function Values

Cut values	**Benzene**	
	Spring	**Summer**
1	1000	1000
2	1000	1000
3	3585/71	3585/71
4	57/14	57/14

Cut values	Benzene	
5	142/85	142/85
6	142/85	142/85
7	571/42	571/42
8	314/28	314/28
9	285/71	285/71

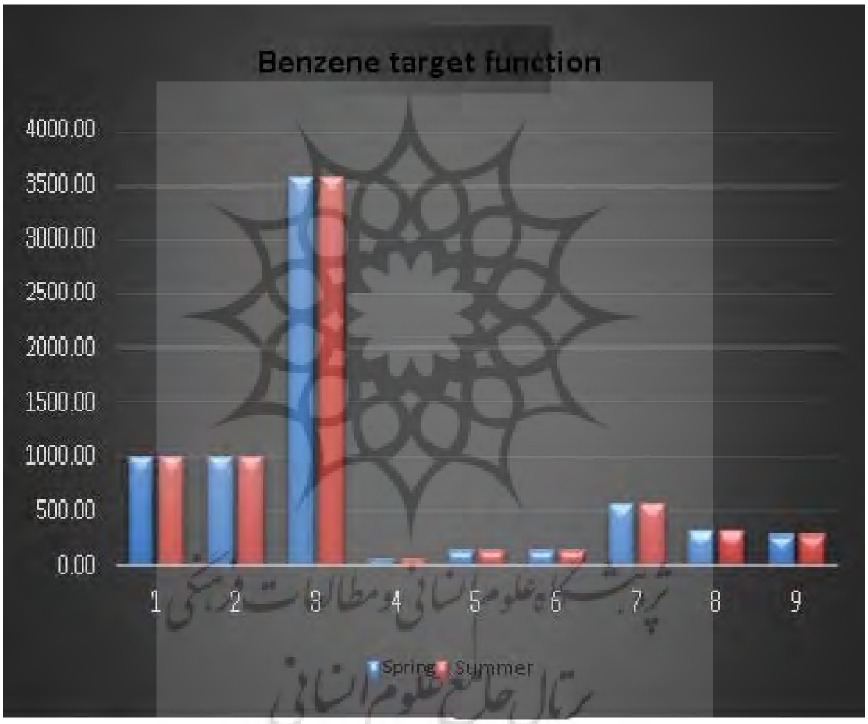


Figure 1

Objective Function of Benzene Value

The cut-off values for the octane target function are show in table 6.

Table 6

Objective Function Values

Cut values	Octane number	
	Spring	Summer
1	2799/17	2773/41
2	2701/77	2766/91
3	350/53	346/59
4	177/23	169/35
5	157/54	136/6
6	157/54	149/66
7	275/69	271/76
8	283/57	275/69
9	196/92	192/98

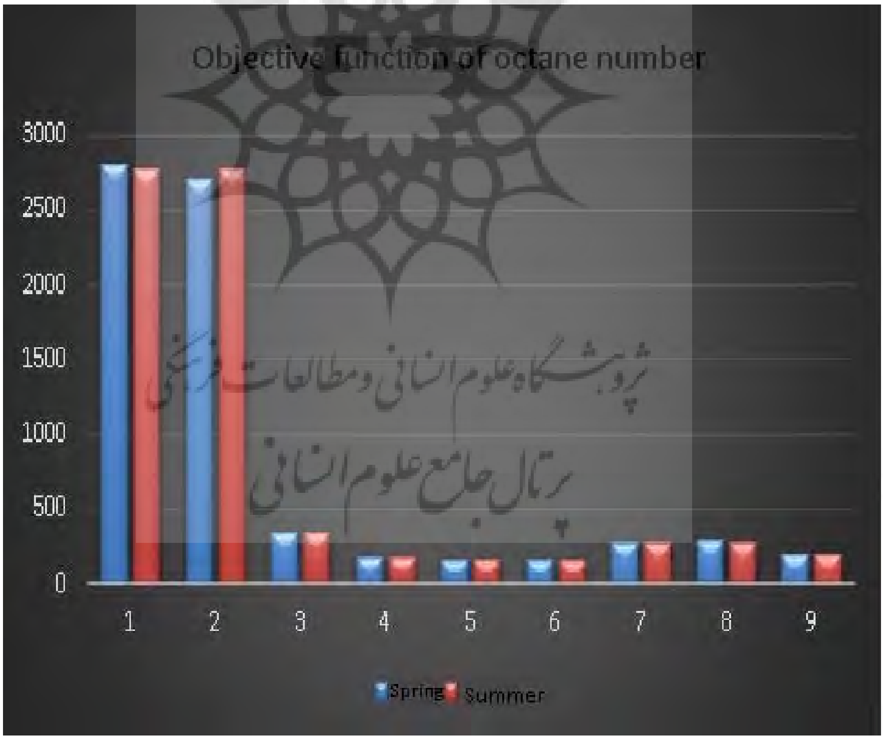
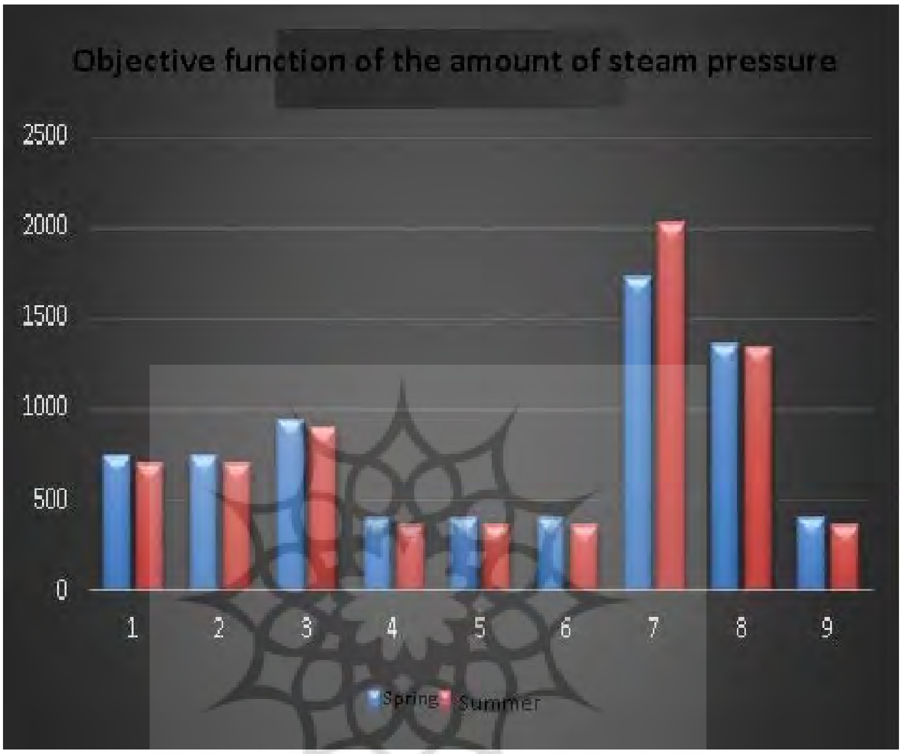


Figure 2

The Octane Number Target Function



The cut-off values for the steam pressure objective function are show in table 7.

Table 7
Objective Function Values

Cut values	**steam pressure**	
	Spring	**Summer**
1	740	700
2	740	700
3	940	1180
4	400	360
5	400	360
6	400	360
7	1720	2020
8	1360	1340
9	400	360

Figure 3

Objective Function of the Steam Pressure Value

And the final amount of cuts to produce 7100 cubic meters per day of gasoline product in summer and spring, which is the result of averaging the cuts for the three objective functions of octane, benzene and steam pressure are show in table 8.

Table 8

The Values of the Objective Function of the Cuts

cuts	spring	Summer
1	1533/06	1491/14
2	1500/59	1488/97
3	1625/41	1704/10
4	211/46	195/50
5	233/46	222/15
6	233/46	217/50
7	815/70	861/06
8	652/62	643/32
9	294/21	279/56

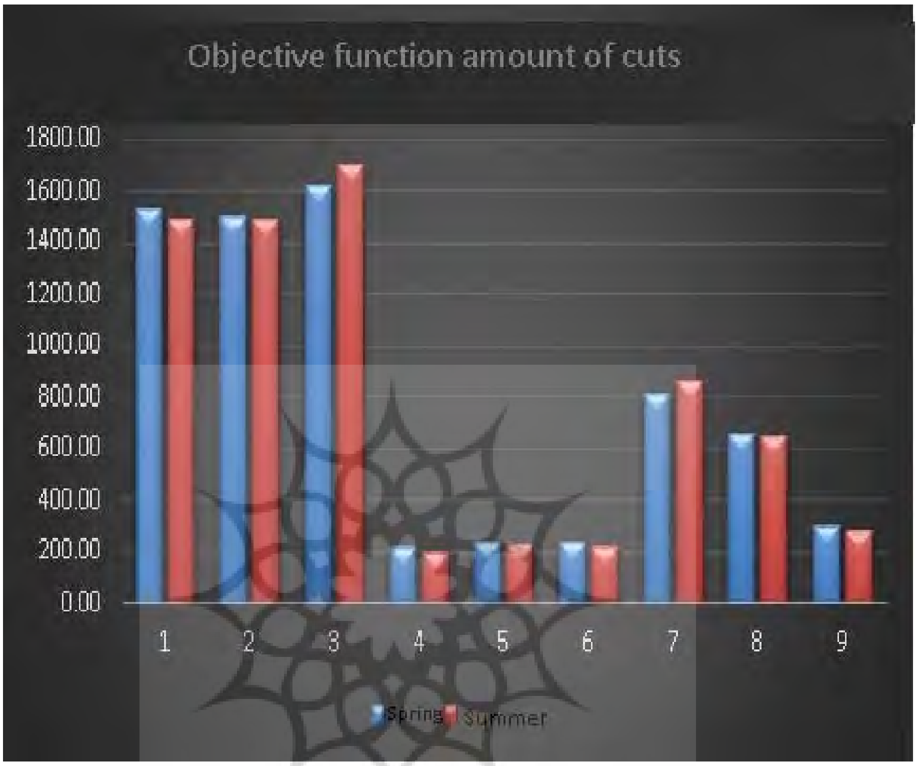


Figure 4
Objective Function Amount of Cuts

Relative warming of the air in summer and reduction of the standard amount of gasoline steam pressure compared to spring, the number of cuts 1 and 2 in the manufacture of gasoline products are also reduced.

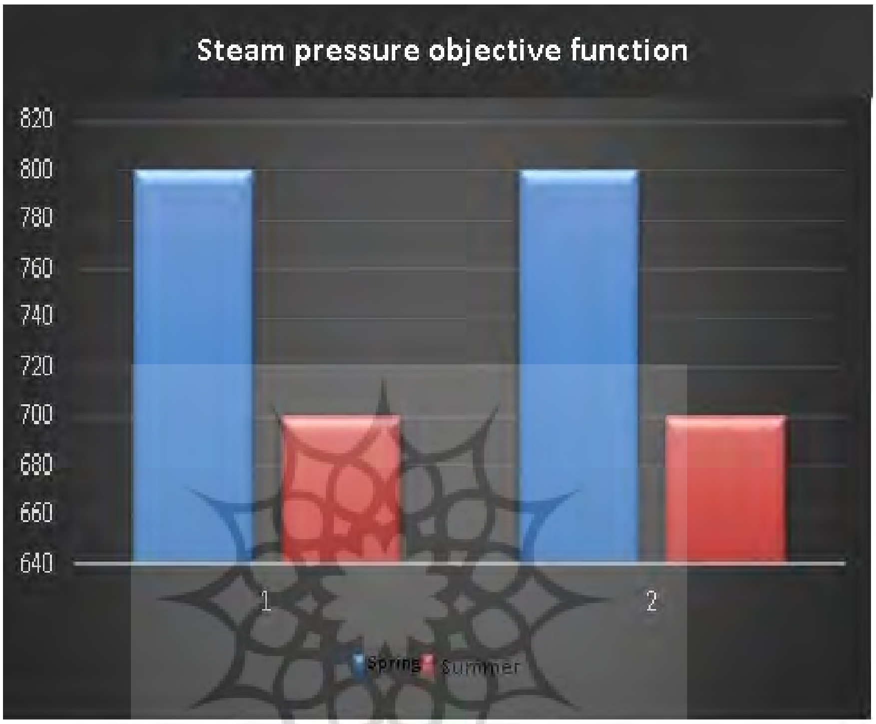


Figure 5
Cutout Values

In order to further analyze the model results by changing the value ⟦Max⟧ _ octone, t we continue the model analysis. It is clear that if we increase the value of ⟦Max⟧ _ octone, t of section 4 in the spring, considering the maximization of the objective function, the model tries to obtain the maximum value by increasing this parameter. As a result, it increases its value and on the other hand, due to the increase of v_ octone max, t, the value of λ_4t is adjusted so that this constraint $\sum_{i \epsilon I} \lambda_{it}.\mathrm{v}_{ijt} = \mathrm{S}_{jt}$ is always present and prevents the problem from becoming impossible. Also, the value of ⟦Max⟧ _ octone, t of section 4 due to its lower limit ⟦Min⟧ _octone, t cannot be reduced by more than 0.01% because it will make the model impossible.

Table 9

Sensitivity Analysis

Parameter	**Maximum octane value changes**	**Target function Maximum octane value** $F_{octone\ max}$	**Objective function Cut value 4 Landa**
$Max_{octone\ ,t}$	+%40	87/2683	253/5931
	+%20	87/1376	217/4084
	0	87/12	161/4809
	-%0.01	87/1203	161/4809
	-%1	87/1203	161/4809
	-%2	Insoluble	Insoluble

Conclusion

One of the most important issues in the field of crude oil is the gasoline product, which is obtained by distillation in the range of 40 to 180 degrees Celsius. Gasoline is a complex mixture of paraffin, petroleum and aromatic hydrocarbons. Also, high emissions of gasoline-burning vehicles inflict irreparable damage on the country's environment, especially in large cities. To the extent that experts believe that the medical costs of these pollutions in the long run are much higher than the annual cost of gasoline for cars. Execution of the model in two-period mode, we analyze the proposed model in two-period mode. For this purpose, in order to solve the problem in larger dimensions, we set the time index for two time periods and solve the problem with Gomez software with version 24.1.2. Also, due to the multi-objective nature of the problem, the weighted method is considered for the objective functions by considering the weights W_ (vapour_pressure) = 1, W_Benzene = 1, W_ (Octone min) = 1, W_ (Octone max) = 1. In the following, the numerical results obtained from solving the model in different periods, which represent two periods, are presented. The results of the optimal amount of the main variables of the problem during different time periods, determining the amount of different oil cuts in each period in order to produce gasoline from the combination of variables, according to the table below will be combined in such a way that it results in the optimal production of gasoline products in accordance with standard specifications. The table above shows the values of these different sections. The results of determining the amount of slices for mixing in two time periods, the amount of steam pressure mixing, octane and benzene to produce the final product of gasoline for each of the nine slices in each time period are show in table 10.

Table 10

Results of Mixing and Octane, Steam and Benzene Values

period	**Cut name**	**Variable**	**period**
		spring season	**summer season**
PLATFORMATE - 1	steam pressure	37	35
	Octane	94	94
	Benzene	0/035	0/035
	Amount	1513/06	1491/14
PLATFORMATE - 2	steam pressure	37	35
	Octane	94	94
	Benzene	0/035	0/035
	Amount	1480/56	1488/97
ISOMERATE	steam pressure	47	45
	Octane	89	88
	Benzene	0/02	0/02
	Amount	1625/41	1610/77
W.Naphta (KHDS)	steam pressure	20	18
	Octane	41	43
	Benzene	0/005	0/005
	Amount	211/46	195/50
H.ISO.Naphta - 1	steam pressure	20	18
	Octane	40	39
	Benzene	0.005	0.005
	Amount	233/46	222/15
H.ISO.Naphta - 2	steam pressure	20	18

period	Cut name	Variable	period
		spring season	summer season
	Octane	40	38
	Benzene	0/02	0/02
	Amount	233/46	217/5
L.S.R.G	steam pressure	75	74
	Octane	70	69
	Benzene	0.02	0.02
	Amount	855/7	954/39
L.Iso.Naphta	steam pressure	68	67
	Octane	72	70
	Benzene	0.011	0.011
	Amount	652/62	643/32
H.S.R.G	steam pressure	20	18
	Octane	50	49
	Benzene	0/01	0/01
	Amount	294/21	279/56

The mentioned sections are: platform of catalytic conversion units, isomer product of isomerization unit, light oil of distillation units, light oil is the isomax unit and heavy oil is the hydrogen refining unit of kerosene that each has its own specifications for octane number, steam pressure and benzene content that depending on the season and as a result of changing the standard specifications of gasoline produced in that particular season, the composition value of the nine sections will be different. As can be seen in the table above, in Chapter 2 (summer), the steam pressure of all the effective sections in the production of gasoline products is lower than in Chapter 1 (spring). Given that summer is warmer than spring, this makes perfect sense. In the hot season, the low steam pressure of gasoline-producing cuts and ultimately gasoline products is directly related to respect for consumer rights. Because if the above issue is not observed, the reduction of the volume of gasoline purchased by the customer while charging the car tank is definite. In addition, the issue of reducing the steam pressure of gasoline in the hot season compared to the spring, is also very important in terms of safety. In the above table, in order to place the variables of steam pressure, benzene and octane number in the standard range, the values of the nine effective sections in making gasoline are also different in each season.

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