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M.Sc.Thesis

The analysis of a current condition of II horizon of deposit Kala and calculation of reserves by a method of evolutionary modeling.

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Referat.

Qala yatağının II horizontun cari vəziyyətinin təhlili və təkamül modeli üsulu ilə ehtiyyatların prognozlaşdırılması.

Diplom elmi işin məqsədi Qala yatağının II horizontun cari vəziyyətinin təhlilidir.

Evalyusiya modelləşməsi köməyi ilə hasil oluna bilən ehtiyyatların hesablanması və həmçinin yatağın fiziki göstəricilərinin qısa təhlili,neftin ümumi ehtiyyatlarının hesablanması, həcm metodu ilə aparılır.

Həmçinin II horizontun işlənməsinin təhlili, işdə bəllidir. Işlənmə periodları, hasilatın yolları, neftin, suyun və mayenin hasilat dinamikası, II horizontun işlənmə parametirlərinin göstəriciləri, işdə izah olunur.

Həmçinin neft yatağlarına suyun təsirinə baluldu. Qalığ neft ehtiyyatlarının müəyyənləşdirilməsi evolüsiya modelləşdirilməsi vasitəsi ilə aparılır.

Abstract

The analysis of a current condition of II horizon of deposit Kala and calculation of reserves by a method of evolutionary modeling.

Object of researches is II horizon of deposit Kala. The purpose of work is the analysis of a current condition of II horizon of deposit Kala and calculation of stocks of oil by a method of evolutionary modeling in work the brief operational characteristic of II horizon is considered. Calculation of stocks of the oil, proexhausted is shown by a volumetric method.

Further the analysis of II development of horizon is given. In it is underlined the periods of development, ways of operation, dynamics of an oil recovery, water, a liquid and other data of development of II horizon is given, the analysis of water in flounce on a deposit is shown. On the basis of application of evolutionary modeling residual taken stocks of oil on II horizon are specified.

Introduction.

The given final work is devoted to the Analysis of a current condition II horizon of deposit Kala and development of actions on increase efficiency before development.

II horizon of deposit Кала is one of the cores operational objects. On number of working chinks it borrows 1-st place, and on an oil recovery 3-rd place.

II horizon is a part Sabunchinskoy of retinue of the top department productive oil-bag also lays on depth of 900-950 meters from a sea level.

Average visible power of horizon makes 28-30 meters.

Development of horizon has been begun in second half of 1933.

In total on II horizon it is put into operation of 368 chinks, (together with returnable). Operation of chinks was conducted, as in the compressor way, and bottomhole -pump.

For the analysis of development of II horizon Petroleum and Gas Extracting Administration it Tagiyev, have been given data on the basic parameters of extraction, on years Q_n, Q_w, Q_g, N_n, etc.

Using, these data we have constructed schedules of change of the cores parameters of extraction.

Apparently from the schedule, the maximal oil recovery is necessary on 1936, it has made 970 thousand ton oil, and in 1937 an oil recovery practically it was reduced in 2 times and has made 424.4 thousand ton oil. Further till 1945 year we see falling of an oil recovery, and since 1946 on 1957 year the some is observed increase in an oil recovery, which колеблется within the limits of 67-50 thousand ton oil and beginning, since 1958 falling in an oil recovery is observed.

Also from this schedule we see, that the quantity is maximal the selected water it is necessary for 1969 and makes 395 thousand ton water.

From the schedule of change watering, we see, that % watering sharply increases, and in 1945 it has made 72.6 %, and maximal % watering it is necessary on 1990 year, also makes 96,6 %.

For increase of an oil recovery on II horizon of deposit Kala, have started to spend the actions founded on application water influences. Pumping waters have started to spend to a layer since 1977.

Under the schedule it is visible, that pumping has given small efficiency and increase of an oil recovery was insignificant. As a result of it, process of water influence has been stopped in 1987year.In time pumping in operation there were 7 delivery chinks and 16 extracting chinks, in total pumping in a layer with 1977 on 1987year 823,210 $м^3$ waters.

Further we spend the forecast of an oil recovery, having applied a method Evolutionary modeling. We shall apply evolutionary model of a kind:

$$\sum Q_n = A + B * e^{\alpha t}$$

Where, A, B, α-constant factors.

$\sum Q_n$-total oil output.

t - time.

Making the analysis by the received results, evolutionary modeling, we shall define the forecast of an oil recovery till 2025 year and $\sum Q_n$ has made 4618.68 thousand ton oil.

The additional oil recovery for 10 years has made 8.39 thousand ton oil.

Contents

1. Geological part II horizon of deposit Kala.

1.1 General data on horizon.

Researches of area Kalinskogo by me it is rather interesting and it is instructive. First of all, the attention that circumstance pays to itself that it proceeded rather long period.

From the moment of when the attention to area Kalinsky (1887) up to a floor of the industry of oil (1932) has been inverted and from the moment of layers the first prospecting chinks of 28 years.

Passing to the historical review of made researches. It is necessary to note the first visiting of area Sorahanov Kalinsky and Simonovich is concerns to 1887. These researchers have found, that the axis of an anticline passes on a south-southeast, with a corner of falling are extremely sated.

The area Kala drew to itself attention of former petroindustrialists.

Gas, which in many places left on a daytime surface, was the basic attribute and a parameter of that in Calais the deposit of oil, on a line of an anticline structure of bowels lays.

Prospecting drilling began since 1904, for this time; with years 1904 for 1917 there were drilled 3 chinks depth of 64,642 meters and 861 meter.

The second stage of prospecting works of area Kalinsky has been started in 1924. By its estimation, this area was the first in comparison with area Surakhanskim. Then and actually, recommended to renew prospecting drilling in immediate proximity from outputs of gas.

1.2 Hydrography.

In cut section Apsheron of adjournment there are no dry sand. All sandy petroliferous breeds on roofs, behind a contour of petroliferous, contain water. And sometimes rather high mineralization.

In powerful sandy layers with small height of a petroliferous deposit, water lies and on the arch, in a sole of a layer, and in layers petroliferous fills in all their capacity.

While in service horizons are lowered in comparison with initial, even in well no tight sand.

Passing to the chemical characteristic of waters it is necessary to tell, that marked for all deposits of Apsheron law with reduction of a mineralization пластовых waters with depth takes place and for Калинского deposits. Salinity from 2 P more top part, is reduced to low up to 1,5.

Waters of the top department rigid, then, as in the bottom department alkaline. Transition from hard water to alkaline is planned in limits НКТ where waters of transitive character take place.

The greatest contents of sulfates are observed in waters of Apsheron-Akchakil adjournment Surakhani of retinue where value SO_4 reaches 0.003 gramme / ek.

Natural decrease of waters sulfate with depth is observed up to 2-3 units, below waters are poorly sophistic about a maximum content of $SO_{4\text{-}0.0001\text{-}0.0005}$.

Petroliferous acids meet in small amounts in all waters. In horizons of Surakhani and Sabunchi retinues what or laws in their distribution is not observed. But in Balakhani to retinue the tendency to increase in the contents of petroliferous acids with depth is planned. By development of Kalinskaya retinue have encountered the known difficulties, caused by original hydro-geological conditions of oil pool frequently were observed a case when a chink having entered in operation get watered and eventually left out of operation.

Prominent feature of display of such waters was their independence of a site of chinks and of distance of a petroliferous contour waters in area Old Kala in a sufficient measure are not investigated yet.

1.3 Stratigraphy.

Geological structure of area it is blocked by adjournment modern and ancient Caspian sea, overlapping all space, except for the central part of territory of a craft where places expose breeds of top and average departments of Apsheron circle.

Deeper horizons on a surface do not leave.

Modern adjournments are expressed by clay; by sand, bumpy sand blows and saline soils adjournment.

The Ancient-Caspian adjournment - the top circle of the ancient-Caspian adjournment has rather a limited distribution and is submitted by a line of the terraces, which are carrying out a hollow of saline soil Kalinskogo (lake).

The average circle of the ancient-Caspian adjournment has most wide distribution in area.

On the basis lythological and faunistic structures and degrees of an inclination of layers are allocated two terraces: complex red, brown ракушниками concreted by bat of and large окатанных limy grains and dense gray limestone with a rare, fine pebble.

The bottom circle of the ancient-Caspian adjournment (the Baku circle) adjournment of the Baku circle are marked in a southwest part of area and submitted by limestone with falling under a corner 2-11°.

Apsheron - Akchagyl adjournment - a circle leaves on a surface in the central part of area, composing the arch and wing Kalinkski and channel folds.

On a surface are exposed top Apsheron and a part of average Apsheron. In total 150 meters Asheron adjournment are exposed, other part of its section is investigated on materials of boreholes.

Top department of Apsheron adjournment on given is submitted to V.V.Vebera a pack yellow - brown and livid clay with two prolayers of dense limestone which are traced on a surface as more or less appreciable folds and basic layers for drawing up of a cut.

Average department of Apsheron adjournment in the uppermost part is submitted by 4 meter layer of limestone being basic horizon and further there is a pack yellow - brown clay the yellow - grey sand, passing in not layered grey and yellow - brown clay.

Directly under Akchagyl there lies productive thickness, which in deposits east Apsheron decided on the top department (capacity of 1100 meters) and the bottom department (capacity of 550 meters).

The top department is subdivided into 3 retinues.

1. Surakhani retinue - clay-sandy with some prevalence of clays.
2. Sabunchi retinue - sandy-argillaceous with weak prevalence of sand.
3. Balakhani retinue - mainly sandy.

The bottom department is subdivided into 5 retinues.

1. Argillo-arenaceous - Nadkirmakinski clay retinue (НКГ).
2. Nadkirmakinski sandy retinue (НКП).
3. Kirmakinski retinue (КС).
4. Podkirmakinski retinue (ПКС).
5. Kalinskaya retinue (КаС).

Materials for lythological and petrography studying of the top department of productive thickness Кала have received samples from a chink №10 and №17.

The top department of productive thickness is stacked in a complex of deposits from rather good dried clays up to medium-grained sand.

From a roof of productive thickness up to VI horizon mineralogical association same, only micas, fragments horn обманки and dolomite create the some people of a variety.

1. Surakhani retinue - prominent feature Surakhani of retinue is change of the general capacity in limits Kalinskaya a deposit from 410 meters, in a northwest part up to 850 meters in a southeast (station Kala).

Capacity on a normal cut is equal to a part of area of 430 meters.

It is possible to tell, that the retinue on 60-70 % is submitted with clays and on 30-40 % by sand.

2. Sabunchi retinue capacity of retinue of 260-300 meters, in a southeast direction it increases up to 370 meters.

Lythologically - the retinue, is submitted layered by sand of grey color, is thin fine-grained with глинами gray-brown, dense, fat.

With increase sandy the contents of quartz to bottoms of retinue the contents increases

Quartz increases up to 70-75 %.

Sabinchi retinue will consist, approximately on 75 % from sand, and therefore can be named, clay retinue.

In cut of Sabunchi retinue 8 basic horizons are allocated: II, III, IV, IVa, IVв, IVc, IVд, IVe and

Sections II-III, III-IV and IVa and IVв.

3. Balakhani retinue - capacity of retinue of 340-370 meters in northwest, in a southeast direction, increases, reaches at an item. Kala 515 meters.

Lythologically it is submitted by sand grey, medi - coarse-grained, containing

Prolayers of grey and brown clays.

In total in retinue of sand and clay sand about 90 %, clay and sandy clays about 10 %.

In cut of Balakhani retinue 6 basic horizons, V, VI, VII, VIIa are allocated, VIII and IX from which industrial petrosaturation have two first horizons, which, on Diagrams, are marked by high ohmic resistance.

1.4 Tectonics.

Kalinsky a place the birth is subordinated folds, which is contoured naked, on a surface folds limestone of average and top departments of Apsheron circle.

Quiet, at first sight, tectonics of Kalinski a deposit established on outputs of Apsheron a circle with depth is complicated.

Originality of tectonics, the top and bottom departments of productive thickness causes to give the separate description of tectonics of these departments.

The tectonics of the top department of productive thickness - in the main, structure of layers of the top department repeats structure established on superficial, exposures Apsheron circle.

The structure on a sole of 1 horizon draws rather wide and flat anticline.

The arch on I to the horizon lying in the basis, Surakhani retinues, is displaced to northwest concerning the arch on Apsheron to layers on 800 meters. In the same direction on 900 meters the arch of a roof of the bottom department concerning the arch on V to horizon is displaced.

Within the limits of the top department, on the trade area it is broken, system of step dumps.

Dumps have parallel prodeleting, about perpendicular axes folds, with

Southeast falling of tripper devices. Amplitudes of dumps fade in the direction of wings folds and with depth a little.

The tectonics of the bottom department, productive thickness - draws, on an applied structural map on top the personal computer where it is submitted, very much believed, wide fold ooze.

As against the top department, the structural map of a roof of the personal computer has three basic tectonic infringements.

The main dump №1 on a vertical is traced on all bottom department and passes and in the top department up to a sole 4 horizons.

Dump №2 as it was already mentioned above, begins on CB a wing with amplitude of 20-30 meters which is kept on prodeleting dump up to a place of merge to the main dump.

Dump №3, as well as dump 1, on a vertical is traced up to bottoms Sabunchi of retinue

(a sole of IV horizon), the amplitude of dump №3 on a vertical changes insignificantly.

Falling of a plane of tripper devices of all three large infringements within the limits of the bottom department to determined it is not obviously possible, in view of absence of cases of crossing by chinks of these dumps, only on the basis of construction of structures, it is possible to tell confidently, that as against flat corners of falling of planes of tripper devices in the top department. In the bottom department corners of falling of dumps about 80-85 degrees.

The big interest represents a question of formation of dumps. Studying of details of a structure shows that dumps of the bottom department is traced in Sabunchi and in part in Surakhani retinues.

The mutual relation of two systems of dumps specifies on time difference of their occurrence.

Younger system of dumps of the top department, productive thickness also displaces bottom more ancient dumps.

1.5 Gas and oil presence.

In a cut of productive thickness of a deposit 7 petroliferous retinues with 40 petroliferous horizons, far not equivalent on the industrial value are allocated.

The deposit of oil across the top department is strictly subordinated to the gravitational theory of distribution of oil and occupies the most raised part folds.

The deposit of oil of horizons of the bottom department is shifted, in relation to a deposit of oil of the top department on northwest in connection with moving of the arch складки, and deposits NKG and NKP also. As well as on the top department occupy the most raised part folds, symmetries axes, and deposits of oil KSand the personal computer are sharply asymmetric and occupy only a northeast wing folds.

Surakhani retinue: In retinue four are allocated of horizon: B.C.C-D,D.

Petroliferosity retinues, it is dated for the raised part of folds, the broken network of step cross-section infringements.

Horizons B and C is, basically gasoliferous, oil lies in at planimetric parts of tectonic fields.

Horizon C-D has the maximal contour petroliferosity and the greatest height of a deposit in comparison with other horizons of retinue.

Sabunchi the retinue - the Basic exploiters objects of Sabunchi retinue is horizons: II, III, IVa, IVв besides between the basic horizons laid foyers of sand with industrial petroliferosity. These are sand of sections: II-III-IV, IVa-IVв and IVв, IVc (IVc, IVд, IVe).

The increased parts of some fields of horizons II, II-III, III, III-IV have been occupied gas layer in an initial stage.

From all horizons of retinue the maximal contour petroliferosity and has height of a deposit of II horizon.

The small clay section capacity of 1-1,5 meters, divides IV horizon, on two packs, the top capacity of 10 meters and the bottom 13-15 meters. The top part of horizon gasoliferous,

Bottom - waterous, i.e. the horizon has bottom water. Oil is dated for separate small sites (sporadic petrosaturation).

Oil in IVa and IVв horizons the same as and in IV, is dated in the top part of horizon, and the bottom part - waterous.

Petrosaturation of the same horizons is limited to small sites; therefore development was made by return.

In clay section between IVв and IV horizons there are three small capacities of petroliferous horizons: IVc, IVд, IVe that, were maintained in common. From these horizons with the greatest capacity of sand and the best petrosaturation it is allocated IVe.

Oil of horizons Sabunchi of retinue high-octane, with the big contents of gasoline and small densities.

Balakhani retinue - is characterized by the big fluctuations by capacity from 350 meters on Northwest, up to 250 meters in a southeast.

In this retinue is present 5 petroliferous horizons, VI, VII, VIII and IX of which, the basic industrial - petroliferous horizons are V and VI.

V the horizon is broken 6-tectonic fields in which petroliferosity it is dated for all capacity of a layer.

VI horizon is petroliferous in the top part of a layer within the limits of 35-40 meters the bottom part waterous.

1.6 Gas presence.

Gasoliferosity of Apsheron - Akchagyl adjournment it has been established in an initial stage of investigation of Kalinski oil deposit.

Within the limits of the developed area, at approbation Apsheron - Akchagyl adjournment, gas with pressure of 8 atmospheres, with debit 20,000 m3 / day has been received.

Apsheron - Akchagyl adjournment - gasoliferous, but commercial operation of gas is inconvenient, in view of absence of marking horizons in cut Apsheron - Akchagyl adjournment.

It is obviously possible, available in Apsheron - Akchagyl adjournment - gas, to take in chinks after their output from productive thickness.

In Kalinski an oil deposit as in other deposits of Apsheron, in a cut of productive thickness of only gas horizons it is not found out, and available gas is the satellite of oil occupies the increased parts of structure of a deposit.

Top hundred-meter pack Surakhani of retinue contains in the increased part of structure gas layer which development in an initial stage were objects of operation of gas. At approbation layer have been received debits of gas $60*10^3$-$80*10^3$м^3, at pressure of 30-40 atmospheres. Duration of operation of separate chinks till 3-6 months.

Then pressure fell up to 2-3 atmospheres, and there was water. Total extraction of gas of some chinks made from 10мл m3 up to 20 ml of m3.

Sabunchi retinue, gasoliferous, but in the increased part of layers gas caps have the majority of oil horizons.

Gasoliferosity of II horizon it is characterized by approbation of some chinks of the increased part of structure.

In the first field at approbation of II horizon in a chink №323 have received pure gas at pressure 24 atm. In the next chink №777 at approbation of II horizon have

received normal debit of oil with insignificant amount of gas, hence, a gas zone on the first field up to depth approximately 905-910 meters.

In the second field at approbation of II horizon in a chink №144 in an interval 895-903, pure gas has been received.

In the next chink №417, from depth of 902-904 meters oil has been received at the normal gas factor.

In the third field, at approbation of II horizon the chink №401 filter (896-909 meters) has entered in operation by pure gas, but a month later has passed on oil with the big gas factor.

In the fourth field, at approbation of II horizon in a chink №450 filter (894-901 meters) has been received pure gas. In the next chink №446 with depth of 903-918 meters oil has been received at the normal gas factor.

In the fifth field, at approbation of II horizon in a chink №752, on depth of 876-880 meters, pure gas has been received. In the next chink №182 on depth of 902-910 meters oil has been received at the normal gas factor. The gas zone on 5-му to a field is distributed up to depth of 905 meters.

On II horizon there is no definition of permeability of composing breeds on cores.

From the analysis of the received data of permeability of a layer within the limits of each tectonic block follows:

I the block - on all three counted up chinks permeability of one order is received within the limits of 331-371 meters gift.

II block - the available data on permeability on five chinks show wide limits of its change, basically, from 145 up to 260 meters gift.

III block - the data on permeability is not present.

IV block - on two chinks permeability makes 123 and 105 meters gift.

V the block - on the available data of three chinks permeability changes in limits 45-85 meters gift.

VI block - on the unique counted up chink permeability makes 51-meter gift.

VII block - according to three chinks permeability changes over a wide range from 29 up to 289 meters gift.

VIII and IX blocks - are characterized basically according to three chinks by high permeability about 500-400 meters gift.

Thus, the received data changes permeability the block of parameters, that peripheral sites of a deposit (VIII, IX and I-II) are characterized by higher permeability of 500-240 meters gift. In comparison with the central part (VI-V-IV) 50-120 meters gift.

As a result of the available data on permeability of a layer on 22 chinks, located in various parts of structure, it is possible to conclude:

1. Average permeability on II horizon makes 200 meters gift.
2. Peripheral sites of a deposit it is characterized by the best permeability in comparison with the central part.
3. Within the limits of blocks change of permeability on structure does not submit to law.
4. In a kind of a small number of chinks on which permeability is counted up and non-uniform their arrangement on the areas, map development equal it is not obviously possible to permeability.

1.7 Geological production characteristic of II horizon.

II horizon of deposit Kala is one of the basic objects of operation.

On number of working chinks it wins first place, and on an oil recovery - the third.

II horizon is part Sabunchi of retinue, the top department of productive thickness. It lies on depth of 900-950 meters from a sea level or 550-600 meters from a roof of productive thickness. Average seen capacity of horizon makes 28-30 meters, effective power of sand of 13,5 meters.

In lythologycal attitude II horizon is submitted by alternation of grey, thin, fine, granular sand and clay grey and brown colors, dense and fat.

The mechanical structure of sand is resulted in the below-mentioned table.

The maintenance of fractions of %				Porosity	Permeability	karbonolity
0,25	0,25-1	0,1-0,01	0,01			
I	10	20-40	60	0,24	------	13

In the tectonic attitude II horizon represents a flat anticline with prodeleting from northwest on a southeast. Corners and falling on the arch folds about 4-5°, on wings increase on the average up to 7-10° and on a southwest wing reach up to 20°. All складка is broken by system of step dumps which have parallel prodeleting about perpendicular axes folds with southeast falling.

Amplitudes of vertical displacement change basically from 60 meters northwest immersing, up to 30 meters on southeast immersing folds. The corner of an inclination of tripper devices varies from 45° in northwest, up to 30° in a southeast, being dragged out, thus, in a southeast direction.

System of the basic dumps of a deposit of II horizon, shares on 9 tectonic blocks, which are numbered in the growing order from northwest on a southeast.

1.8 Characteristic of oil, gas and water.

Gaso-petroleum saturation is dated for all sandy layers a cut of horizon, on diagrams seeming resistance by oil of the sated part of breeds, changes within the limits of 2-5,5 ohm / meter. Water-oil contact in an initial stage of development beat off on depth of 960-980 meters. Height of a deposit of 140 meters.

II horizon is characterized by high oil feedback. Initial дебиты some oil reached up to 20 tons day. The characteristic of oil is resulted in the table.

Densities of oil		% of pitches	Gasoline		Octane number
On a surface at 20°C	In conditions of a layer		%	Densities	
0,857	0,785	13,65	7,19	0,797	75,5

In an initial stage of development in separate chinks located in the raised part of structure (in different tectonic fields) pure gas has been received. The given approbations have allowed revealing gas zones in I, II, III, IV, V, VI tectonic fields. Chinks in which pure gas has been received below are resulted.

Serial number	№№ Chinks	**Field**	Square on the plan	Filter
1	323	I	G-6	893-900
2	144	II	D-7	895-903
3	401	III	E-6	896-909
4	106	III	E-9	878-883
5	450	IV	E-9	894-901
6	189	IV	J-8	877-882
7	290	IV	E-9	893-898
8	752	V	J-9	876-880
9	788	VI	Z-10	886-898
10	756	VI	Z-11	889-914

The interval of lumbago of these chinks testifies that in an initial stage of development the gas zone was distributed, approximately up to depth of 910 meters.

Initial debit gas changed in limits 20000-70000 meters^3.

In VII, VIII and IX fields of only gas zones was not. Now the gas zone was kept only in VI field, on what the current chink № 1385 with debit 4000 meters^3 gas specifies.

In other fields, later the chinks entered into operation (in the increased part of structure) give oil with water.

The structure of gas is resulted in the under laying table.

Methane	Ethane	Prosier	Butane	Maximum hydrocarbons	CO_2 %	Densities
95,37	2,62	0,44	0,53	0,39	1,14	0,5920

On the химизму waters of II horizon concern to type of hard water and have the following characteristic.

Across Boma	Ce	By Palmer			
		S_1	S_2	A	B
13.6-15	0.2588-0.2212	82.0-73.46	22.00-17.68	0.04-0.40	0.5122-0.4011

Waters extracted with II horizon basically concern to подошвенным. Layers we have plan metric waters in the separate chinks located in lowered parts of structure.

2. Technological part II horizon of deposit Kala.

2.1 Analysis of development of II horizon

Development of II horizon has been started in second half of 1935. Prior to the beginning of mass development the horizon has been tested in 7 chinks (returned with below laying horizons) from which in 6 chinks industrial oil has been received and in 1 chink located in сводовой parts gas is received.

The specified chinks have settled down in different tectonic fields. Thus, starting mass development in 1935 obviously it was known about industrial нефтеносности 5 tectonic fields, and that roof the part of horizon has been occupied with gas.

Taking into account this position, development was carried out from the lowered parts to the arch on a triangular grid at distance of 125 meters between chinks or 2 acrs on 1 chink.

With a view of delay of falling layer pressure, at drilling separate tectonic fields, have been left gas zones, and in chinks located in top parts, under operation the bottom part of horizon has been taken.

In total on II horizon it is entered into operation on 1971368 chinks (together with returnable chinks).

Initial debit chinks during development in various tectonic fields were within the limits of 40-80 thousand tons, on occasion reached up to 150-200 thousand tons and in the subsequent changed within the limits of 5-15 thousand tons.

Operation of chinks was conducted as compressor way, and глубинно by pump way.

Average length of the filter of 4-6 meters, on occasions 8-10 meters. According to approbation and operation it has been revealed industrial petrolity on the area 396,5 acres on which has visited in operation of 368 chinks, at average condensation on 1 chink 1,4 acres. The current area patroliferosity makes 277 acrs, which in comparison with initial figure specifies small promotion of planimetric waters.

2.2 Mode of a deposit.

From all chinks given oil from II horizon:

155 have entered operation by pure oil and 27 distances at development pure gas, it basically of a chink tested horizon in an initial stage of development.

157 chinks have entered operation more later time, simultaneously oil and water, 21 chink have not been mastered, 8 chinks distances at approbation 100 % water from which in 7 chinks water was bottom.

Other chinks, besides the chinks, which have entered operation together with water, have the waterless various periods, which on the average make from 6 till 12 months.

On the other hand in an initial stage of development display gas-resistant a mode and a mode of the dissolved gas takes place. In a number of chinks of the raised part of structure pure gas or oil with the big gas factor has been received. Initial gas factors were about 350-450 m^3.

Sharp falling of oil after the first 3 years of development of a deposit, testifies to presence of a gas mode.

The next years transition to the mixed mode of the dissolved gas and in part water-pressure head is marked due to display bottom waters.

Since 1946 extraction of water grows (initial debits these years reaches up to 20-30 tn oil in day), and on oil stabilization is observed. The current gas factors much more have decreased also steel about 15-50 m^3 / m^3 in the lowered parts of structure, and 100-200 m^3 / m^3 in the raised parts of structure.

2.3 Condition of a deposit before influence.

It agrees « the project on realization of secondary methods of operation on II horizon » made in 1947, carrying out of secondary methods of development in the separate tectonic detached fields has been stipulated.

On one of the elected sites (I) carrying out of a method outer-contour waters (III horizon) is projected and on the other site (II) the method закачки gas (V horizon) i.e. in the raised zone of a layer is projected.

In the first chosen site in operation there is one chink with daily debit 1,5 tn oil, deeply pump way, at a suspension bracket of 850 meters. The others 12 chinks are in idle time.

In the second site in operation there are 6 chinks in deeply pump way, at a suspension bracket from 800-850 meters. The others 17 chinks are in idle time for the various reasons.

Serial number	Quantity of working chinks	Standing idle fund of chinks					Liquidated chinks	Returned chinks	All chinks
		Defective quantity	100% Watering	Closed	Catch pipes	Малодебитные и пробкообразующие			
1	1	1	2	-	1	7	-	1	13
2	6	3	-	1	4	6	3	-	23
In total on 2 sites	7	4	2	1	5	13	3	1	36

Examined sites were developed in the basic 1935-1936 and in later time 1946-1947 by means of return.

Development was carried out on sites independently, irrespective of other fields, on a triangular grid at distance of 150 meters between chinks. Drilling it was carried out from the lowered parts of structure, moving in top part of a field. Such system

has been accepted for preservation of a gas zone from premature decontamination and sharp decrease of layer pressure. On the chosen sites working chinks are maintained depth by pump way.

In an initial stage of development of II horizon, a chink of considered sites came into service in the gushing, compressor way and only falling debit were translated for gas-pump way.

Initial debits were from 125-25 tons of oil, and in last chinks returned in 1946-1947, debits them did not exceed 2-9 tons of oil day.

The initial contour of a gas zone passed on horizons of 860-870 meters.

Initial mid the gas factor on (I) site is equal 450 m^3, and on (II) site is equal 367 m^3.

The data on the gas factor of gauging initial layer pressure upon 1947 are not present; it is accepted equal to pressure of a hydrostatic column of the liquid, corresponding to depth of chinks that means 90-100 atmospheres.

Static levels on chinks (I) site on the average 726 meters, and on (II) site 720 meters.

Thus, layer pressure does not exceed 18-20 atmospheres.

Petroliferosity of II horizon basically the top part of a layer usually in the raised part of structure gaseous and top is dated for the bottom part of cut parts of structure all cut gaseous.

In a virgin condition of tectonic fields in free parts had gas layers (fields № 3,4,5 and 6 which were kept on 1) US-47.

Initial contours pertoliferosity the chosen sites, in the north and the south are limited to the tectonic infringements separating with the next tectonic fields. In the western part of 1 site the contour passed on horizons of 960 m. in the east is limited gas.

The current contour passes across 900 m. above on revolt of chinks № 421 and 382 leading round on 100 - 90 % layer water.

On 2 sites initial a contour in the east passed across 940 m, in the West on 950 m are horizontal. The current contours pass in the east on 900 m is horizontal. And in the West on it is horizontal 890 - 900 m.

On a basis this layer the most suitable for the appendix of secondary methods is higher than the stated characteristic of II horizon.

The layer is in such period of development when there is no active approach of plan metric waters, and layer pressure rather quickly falls.

Chosen V the tectonic field for maintenance of pressure, by increase of gas in a gas uterus is located between two dumps, and dumps are blocked by layers few no tight breeds that makes a site quite especial and as though sealed dump. Outflow of forced air in an extraneous layer that promoted also by absence of dumps and cracks on the field. Depth of a layer is not great 870 - 920 m. Corners of falling 5-7.

Gaza - a capillary mode with the limited radius draining, rather small layer pressure about 16-18 atm.

Debit of oil on separate chinks changes from 3 - 10 so-called in day with water from 50 up to 70 %.

Absence of a zone on the chosen site enables promotion of forced air.

The chosen third tectonic field, about plan metric three dumps, which are blocked by layers of the weak permeability, very much suitable to carrying out of influence by uploading waters.

Small size layer pressure 13-25 atm., debit chinks of 1-1,5 tons of oil located on the given field, small useful capacity 13-15 atm., absence of dumps and cracks able to be places of outflow. Presence of water capillary mode, a plenty of residual oil in a layer of 341130 tons of oil that makes 55 % of an initial stock, (the initial stock makes 553115 tons of oil, 211984 tons of oil are taken).

Thus, at given development cycle Kalinski of a deposit the most suitable to application of secondary methods II horizon, which meets all requirements. Small depth of horizon of 870-920 meters from a sea level or 550-600 meters from a roof of productive thickness, has a significant amount of chinks, less others watered (in

the majority of chinks operation because of a low level is stopped), and also tectonic features of II horizon is good to conditions of application of secondary methods.

2.4 Process of water influence

Uploading waters and air carried out influence on II horizon.

Let's stop on each of methods separately.

With the purpose of realization of water influence on a layer, were carried out trial uploading sea water about 1/1953 years, through 6 delivery chinks №№ 418,463,369,421,400,281, located in III, IV and VIII tectonic fields. Thus the forcing of water in a layer had sporadic character. The longest uploading was carried out on chinks №№ 369,418,463. On three other chinks №№ 400,421,281 because of bad absorbing ability, uploading waters some days were carried out all.

As it mentioned above, the most long uploading waters was conducted through chinks №№ 369,418,463. Below in the table it is resulted uploading and selection on the bushes formed by the specified delivery chinks.

№№ chinks	Mode		Duration of uploading in days	All uploading waters of m^3	Selection on operational chinks			
	$Ом^3$	P atm.			In day		In time uploading	
					Oil	Water	Oil	Water
369	50	15	186	12019	2,6	2,6	827	9180
418	40	40	181	8466	0,8	1,6	322	565
463	50	20	96	6061	-	-	-	-

Daily uploading waters on all chinks has made 130-140$м^3$, at pressure of a forcing 15-40 atm.

Under influence there were 4 operational chinks №№ 394,284 (a bush of a chink №418), and №№ 384,452 (a bush hole №369).

As to a delivery chink №463 on distance of 300 meters from it maintained chinks were not.

To define influence uploading it is not possible, as uploading it was conducted periodically and short time.

In a kind of that process of a forcing of water in II horizon is started in VI-1950 to year, through a chink 291 located in V a tectonic field. Later other delivery chinks №№ 778,472,295,291,285,560,274,254,202 have been commissioned also.

In total forced air through 9 chinks.

№№ Chinks	Date of input in a forcing	Duration uploading in days	Total uploading in m^3	Average the daily charge of air	Pressure of a forcing in atm.
291	VI-50	1221	4085345	3000	30
285	II-51	1370	6994925	6000	40
472	III-51	1742	4332340	2000	25
295	III-51	893	2272024	3000	40
778	IV-51	303	702240	2000	45
860	II-53	38	155380	3000	28
254	VIII-53	136	1282900	7000	30
274	IX-53	1078	4851290	3000	35
202	III-54	640	3309300	5000	30

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In total uploaded in a layer of air about 28 million m^3.

Delivery chinks have been located in many tectonic fields: №472 in I a field, №778 in II field, №№ 274,285,295 in III field, №№ 202,254,260 in IV field and №291 in V a field. At carrying out of process some cases of break of air, caused reduction of debits oil and deterioration of operation (jamming of plunger) are marked. It was observed on operational chinks №№ 694,182, located near to delivery chinks №№ 560,291, and in №№ 202,300 from delivery chinks №№ 254,778, at pressure of a forcing 30-35 atm., and daily uploading 3000$м^3$.

With breaks uploaded air struggle was not conducted. From 17 operational chinks, which are taking place near to delivery chinks, efficiency uploading air is established on 3 chinks (№№ 657,147,436, a bush №№ 472,274) as stabilization and appreciable increase in an oil recovery. The general gain on 2 bushes makes 2049 tons of oil.

№№ Chinks	An oil recovery	
	General	Including a gain
147	11367	936
657	4975	336
436	2755	777

In connection with absence of results on the majority of chinks and breaks of air in operational chinks, uploading air in a deposit of II horizon it is stopped in 1956.

II horizon is one of the basic objects of operation. On number of working chinks it wins first place and on an oil recovery the third place. Current debit oil on the average makes 1,2 tons/day, waters 15м^3. пластовое pressure 15-20 atm, dynamic levels at average depth of chinks of 900 meters, about 800-850 meters.

The deposit is in a late stage of development for which intensification application of methods of increase of petrofeedback is necessary.

With this purpose 1964 again it has been started trial uploading sea water, in the beginning through two chinks №№ 654,394 located on two adjacent tectonic fields.

Later in 1965-66 in a forcing seven more chinks, №№ 622, 647, 1236,160,337,419,756, located in various parts of the area have been entered. Thus all in II horizon, a forcing of water since 1964 it was made through nine chinks, placed on sectional system inside a contour petroliferosity.

№№ chinks	Average uploading waters of m^3	Pressure of a forcing atm.	Date of the introduction into a forcing	Uploaded all water in m^3	Date of a stop	The reason of the termination uploading
654	70	20	-64	119256		Chinks of working fund
622	70	40	-65	100497		
419	30	45	-67	53798		
756	130	48	-67	125620		
394	-	-	-64	14605	-66	It is liquidated owing to deformation of a column
647	-	-	-66	4004	-66	It is liquidated, (watered an operational chink №539)
337	-	-	-66	6716	-66	It is liquidated, (watered an operational chink №730)

1236	-	-	-66	1606	-66	It is transferred in an observant chink, in communication of an operational chink №1486
160	-	-	-66	3513	-66	It is liquidated for the technical reason

However apparently from the table the majority of these chinks has been stopped in consequence of a slope of a column (№№ 394,160), or watering operational chinks (№№ 647,337,1236) therefore, more or less long forcing of water was made on chinks (№№ 654,622,419,756) on which it is made закачка and now with total volume 300м^3/day, at pressure of a forcing 20-48 atm. The skilled forcing of water in II horizon proceeded in the complicated conditions. So uploaded water was distributed on the washed most out sites of a layer owing to what took place of watering the operational chinks, the termination which has compelled on occasion uploading (a bush №№ 647, 337, 1236). With the purpose of possible redistribution uploading waters on a chink №654, have twice made uploading dense oil, with viscosity 50-60 p. However the noticed changes in work of chinks after oil blockade to note it was not possible.

2.5 Current condition of a deposit.

1. The characteristic of fund exploiters chinks covered with process.

On the petroliferous area in 227 acres process of flooding on sectional system is conducted on 4-th chinks: № 654,622,419 and 756 with total uploading 300 m^3. Coefficient uploading makes 1,5.

The charge of water on 1 tone, the extracted oil of 15 m^3. Under influence there are 19 chinks with the current oil recovery 19 tone of water of 180 m^3 day.

Daily debit of oil on 1 chink of 1,0 waters of 9,5 m^3. In general on 1/1 - 1971 in operation from 2 grades there are 70 chinks an expiring oil recovery 60 tones of oil and 980 tone of water in day.

Water extracted production of 93 %

Average depth of chinks - 938 m.

Way of operation deeply pumps, at an average suspension bracket of the pump of 900 m.

The dynamic level is counted up on 10 chinks on 1/1 - makes 884 m 1971. Owing to low dynamic levels the majority of chinks are maintained at a potential mode.

The current gas factors changes in limits from 10 up to 60 m^3, reaching 110 m^3 in the raised part of structure.

Average value of the gas factor of 55 m^3.

2. The horizon is characterized by a mode of the dissolved gas with display bottom waters.

Layer the pressure measured on 21 chinks by a deep manometer in 1970 changes from 6 up to 70 atm. or on the average 34 atm.

The current factor extraction of stocks 0,52.

The current condition of development 2 horizons is characterized:

а) Insignificant oil feedback owing to few effective mode.

б) Low layer pressure therefore operation proceeds at significant depression on a layer with the subsequent and leavings of chinks.

The specified features once again confirm about necessity of the further continuation of process of artificial influence on 2 mountains.

2.6 Efficiency of spent process.

The analysis of influence on bushes shows 2 horizons, that on 3 bushes, namely №654, 622 and 419 we have positive influence where in operation there are 16 chinks, with total debit oil 16 tone of water of 130 m^3.

Let's consider results of flooding on these bushes on a condition 1/1 - 1971.

Bush of a delivery chink № 654.

The beginning uploading waters - 15.08.1964 we see the beginning of an appreciable forcing of water since September 1965.

Дебит oil 1,7 tone in 08. - has increased up to 2,3 tone in 09. - 1964 and further exceeds a daily level of an oil recovery before influence, that, undoubtedly, testifies positive influence закачки.

The additional oil recovery, which has been counted up, on the given bush, makes on 1/1 - 1971 - 2688 tone

The forcing of water in a chink № 654 has led to some growth layer pressure on chinks of this bush approximately on 3 - 7 atm.

On a number of chinks of this bush stabilization and growth daily average debit oil is marked. For example, on a chink № 360 daily average дебит about 1,5 tone in 1964 has increased up to 2 tone in 1966.

Then some time has decreased up to 1 tone, and with 05. - 60 has increased up to 4 tone.

The bush of a chink № 622 is located in the central part of the area where within the limits of the separate tectonic block, under influence there are 8 chinks. For the given bush excess of selection above uploading by virtue of what is characteristic, influence of influence was not felt. The bush as a whole was not effective.

Since 01.1968 uploading have doubled about 30 m^3 up to 70 m^3, influence of influence began to be felt. Additional extractions on the account of process are made with 502 tone, on a number of chinks № 184,541,673 bushes № 622 are marked stabilization debit oil within the limits of 2 - 1,5 tone.

The following chink № 419 15.12.64 entered into a forcing is located in contour parts of a layer where is higher on revolt from it up to II horizon, four chinks are maintained

№ 277,294,298,686. Efficiency on a bush began with 01.1965 г, and then during two years 1966-67 of efficiency on a bush it was not observed, and from 10.1967 for 12.1970 the bush is effective. The gain of oil due to process makes 289тонн.

Time reduction of debit oil on a chink in day speaks reduction in positive ability of a chink about 30 m^3 in 1965 up to 10 m^3 days in 1966. Owing to demolition of a column in a chink № 394 further forcing of water has been suspended. Uploading waters have transferred in the next chink № 419 which entered in a forcing 03-1967.

In the table № 11 the basic parameters of influence on II horizon are submitted.

On the basis of the data placed in the table it is possible to make the following conclusion.

Beginning uploading	Beginning of efficiency	Quantity of delivery chinks	Quantity of the chinks covered in operation	Total uploading waters (m^3)	An oil recovery covered with air (tone)	Additional extraction (tone)	Factor uploading		Layer pressure average atm	Gas factor m^3	Specific charge on 1 tons of a gain	Factor of used stocks		% of efficiency
							Current	From the beginning of influence				Current	Final	
III/1964	IV/1965	4	19	445734	47947	5270	1,5	0,98	34	55	116,5	0,52	0,57	11,0

The skilled forcing of water in a layer has confirmed expediency of application of flooding of II horizon. Due to increase in petrofeedback of layers, 5270 tons of oil that makes 11 % from extraction received for the period of process is in addition extracted. At the same time it is necessary to note, that the skilled forcing of water proceeded in the complicated conditions. So, uploaded water was distributed on the washed most out sites of a layer owing to what took place обводнения the operational chinks, compelled separate cases, the terminations uploading. Process

by virtue of the specified lacks appeared insufficiently effective and economically unprofitable. Charges on a forcing of water do not pay off.

The parity of volumes uploading waters and selections of a liquid from a layer is resulted in the following table.

№№ bushes	Total uploading	Selection from the beginning development (ton)			Parity uploading to selection from the beginning of development
		Oil	Waters	Liquids	
419	53798	266256	220787	487043	0,10%
622	100497	235991	412922	648913	0,15%
654	119256	286029	416950	702979	0,17%
756	125620	57779	208664	266443	0,47%

Examining the table, we see, that in comparison with the selected liquid, in a layer uploaded a small amount of water. The parity uploading waters on separate bushes and selections of a liquid from a layer from the beginning of development changes from 0,1 up to 0,47, that it is not extremely enough for effective conducting process. However despite of the specified lacks, it is necessary to recognize expedient continuations of a forcing of water in II horizon, with scope of a deposit, influence on all area. With the purpose of the further development of process area flooding on sectional system, we notice 8 more chinks, basically from standing idle and the liquidated fund of chinks, which can be used for a forcing. At such fund of the delivery chinks placed on all area, scope of a layer by sectional flooding will be relative the greatest.

2.7 Calculation of stocks.

Calculation of an initial stock of oil made by a volumetric method in 1952 in oil expedition by an academy of sciences of the Azerbaijan republic makes 8151 thousand tone.

The current operating ratio of geological stocks 0,51, and taken 0,93 (at final factor of extraction 0,57).

Residual geological stocks on horizon for 1/1-1971 year makes 3912 thousand tons of oil, residual stocks of oil make 407 thousand tons.

2.8 Conclusions and recommendations.

1) Taking into account positive influence uploading, observable, as on bushes as well on chinks, we offer the further continuation of process on all area. Additional extraction due to process makes 5270 thousand tons.

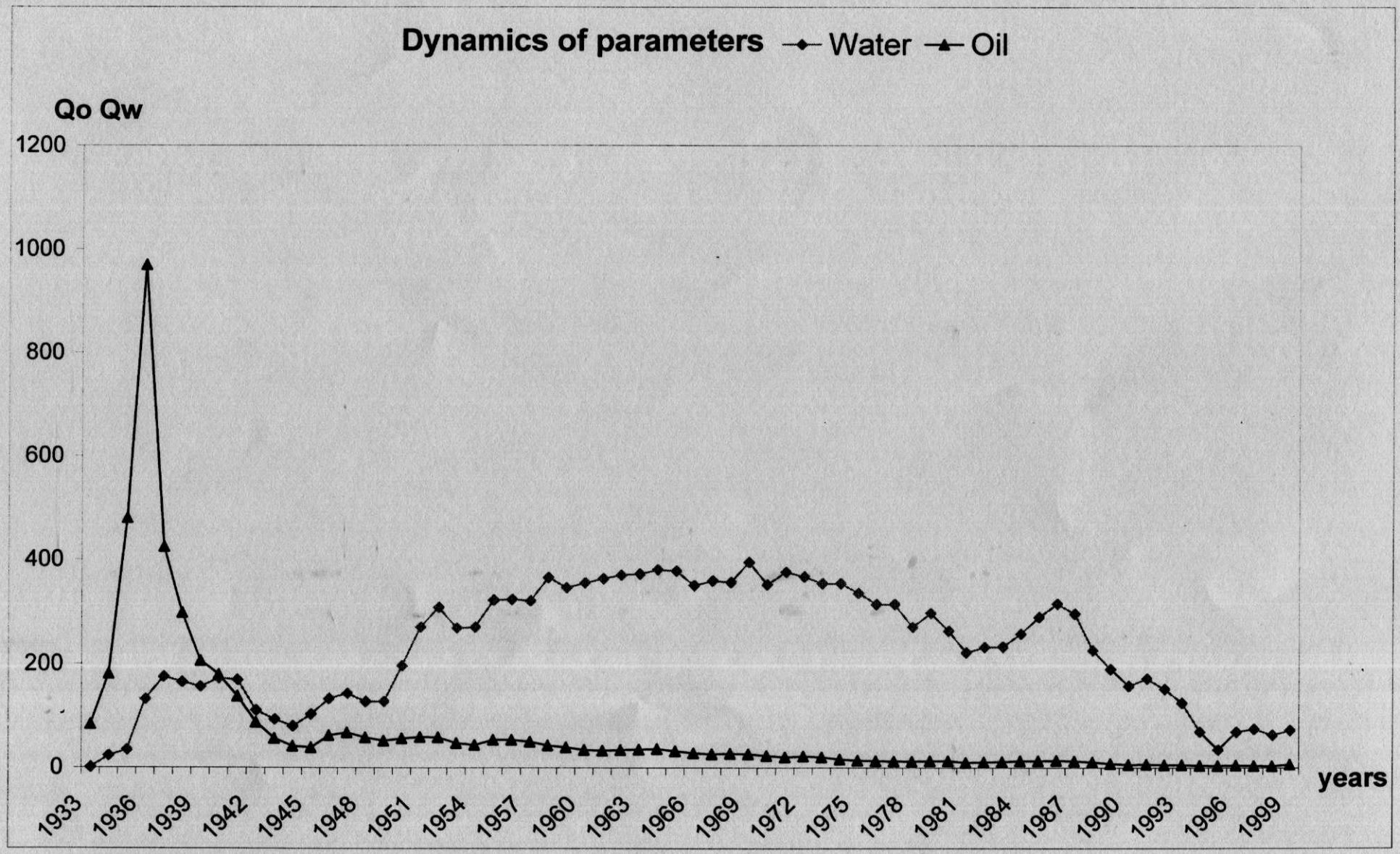
2) Realization of process has allowed using more full stocks of oil on II horizon where the current operating ratio of stocks makes 0,52.

3) With the purpose of the further development of process area watering on sectional system to add an existing grid of a forcing to 8 more chinks.

4) With a view of alignment of a structure of absorption and the best scope by influence of all productive pack of a cut to make for one of delivery chinks skilled uploading waters.

Table 1

YEARS	EXTRACTION FOR A YEAR (THOUSAND TONE)			% WATERING	QUANTITY OF CHINKS IN OPERATION	EXTRACTION OF GAS (MILLION M^3) FOR A YEAR	EXTRACTION FROM THE BEGINNING OF DEVELOPMENT		
	OIL	WATER	LIQUID				OIL (THOUSAND TON)	WATER (THOUSAND TON)	GAS (THOUSAND ON)
1933	84	1	85	1,1	2	0,01	84	1	0,01
1934	181	23	20,4	11,2	7	0,03	265	24	0,04
1935	479,9	34	513	6,6	71	0,09	744,9	58	0,13
1936	970	132	1102	11,9	159	0,26	1714,9	190	0,39
1937	424,4	175	592	29,5	157	0,29	2139,4	365	0,68
1938	298	165	462	35,7	123	0,32	2433,4	530	1
1939	205,6	156	361	43,2	103	0,34	2638,6	686	1,34
1940	179,3	172	350	49,1	95	0,36	2817,3	858	1,7
1941	137,8	169	307	55	81	0,37	2955,7	1027	2,07
1942	876	110	198	55,3	55	0,37	3049,3	1137	2,44
1943	56,4	93	149	62,4	43	0,37	3099,7	1230	2,81
1944	41,3	80	121	66,1	36	0,38	3144,0	1310	3,19
1945	38,9	103	142	72,5	34	0,38	3170,7	1413	3,57
1946	62	133	195	68,2	39	0,39	3241,7	1546	3,96
1947	67,7	143	211	67,7	46	0,4	3309,4	1689	4,36
1948	58,2	127	185	68,6	47	0,41	3363,6	1816	4,77
1949	51,7	127	182	69,7	43	0,42	3422,3	1943	5,19
1950	56,3	196	252	77,7	55	0,42	3478,6	2139	5,61
1951	59	270	336	82,4	76	0,43	3537,9	2416	6,04
1952	58,6	308	366	84,1	80	0,44	3595,8	2724	6,48
1953	47,1	268	315	85	79	0,44	3642,9	2992	6,92
1954	43,6	270	314	85,9	76	0,45	3694,5	3262	7,37
1955	53,5	322	375	85,8	89	0,45	3740,0	3585	7,82
1956	53,6	323	377	85,6	93	0,45	3793,6	3908	8,27
1957	50	321	371	86,5	86	0,45	3843,6	4229	8,72
1958	43	365	408	89,4	81	0,46	3886,6	4594	9,18
1959	39	346	385	89,8	74	0,49	3925,6	4940	9,67
1960	34	355	388	91,2	75	0,53	3952,6	5295	10,2
1961	33	363	396	91,6	70	0,7	3992,6	5658	10,9
1962	34	370	404	91,5	68	1,1	4026,6	6028	12
1963	35	372	407	91,4	71	1,4	4067,6	6400	13,4
1964	36	380	416	91,1	74	1,9	4097,6	6780	15,3
1965	32	378	410	92,1	77	2,2	4129,6	7158	17,5
1966	28	350	378	92,5	79	2	4157,6	7508	19,5
1967	26	359	385	93,2	81	1,3	4178,2	7867	20,8
1968	27	356	383	92,9	84	1,4	4210,6	8223	22,2
1969	26	395	421	93,8	87	6	4236,6	8618	28,2
1970	23	352	375	93,8	87	5,2	4259,6	8970	33,4
1971	20	376	396	94,6	79	3,8	4279,6	9346	37,2
1972	22	367	389	94,3	80	3,2	4301,6	9713	40,4
1973	20	354	374	94,6	78	3	4321,6	10067	43,4
1974	16,2	354	370,2	95,6	78	2,6	4337,8	10421	46
1975	14	336	350	96	74	2,9	4351,8	10757	48,9
1976	13	314	327	96	73	2,4	4364,8	11071	51,3
1977	12,5	314	326,5	93,4	70	2,2	4377,3	11385	53,5
1978	12	271	283	95,7	69	2	4389,3	11656	55,5
1979	13	297	310	95,9	75	3	4402,3	11953	58,5
1980	13	263	276	95,3	77	2,6	4415,3	12216	61,1
1981	9,9	222	231,9	95,7	80	1,5	4424,2	12438	62,6
1982	10,7	232	242,7	95,6	84	0,6	4435,9	12670	63,2
1983	11,3	233	244,3	95,4	91	0,4	4447,2	12903	63,6
1984	13	258	271	95,2	94	0,7	4460,2	13161	64,3
1985	13	290	303	95,7	100	1	4472,2	13451	65,3
1986	13,8	315	328,8	95,8	90	0,7	4480,4	13766	66
1987	12,6	296	308,6	95,9	89	0,4	4493	14062	66,4
1988	10,5	226	236,5	95,6	77	0,3	4503,5	14288	66,7
1989	7,4	190	197,4	96,2	50	0,6	4510,9	14478	67,3
1990	5,6	158	163,6	96,5	50	0,9	4513,5	14636	68,2
1991	6,3	172	178,3	96,6	47	1,3	4522,8	14808	69,5
1992	5,5	151,7	157,2	96,5	41	1,1	4528,3	14959,7	70,6
1993	5,1	125,2	130,3	96	40	0,8	4533,4	15084,9	71,4
1994	3,9	69,4	73,3	94,6	21	0,7	4537,3	15154,3	72,1
1995	3,5	34,5	38	90,7	34	0,3	4540,8	15188,8	72,4
1996	4,4	69,2	73,6	94	34	0,6	4545,2	15258	73
1997	3,6	74,9	78,5	95,4	24	0,6	4548,9	15332,9	73,6
1998	3,2	63	66,2	95,1	12	0,6	4551,8	15395,9	74,2
1999	6	72,2	78,2	92,3	24	1	4557,8	15468,1	75,2


Dynamics of parameters
Water
Oil
Qo Qw
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600
400
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years
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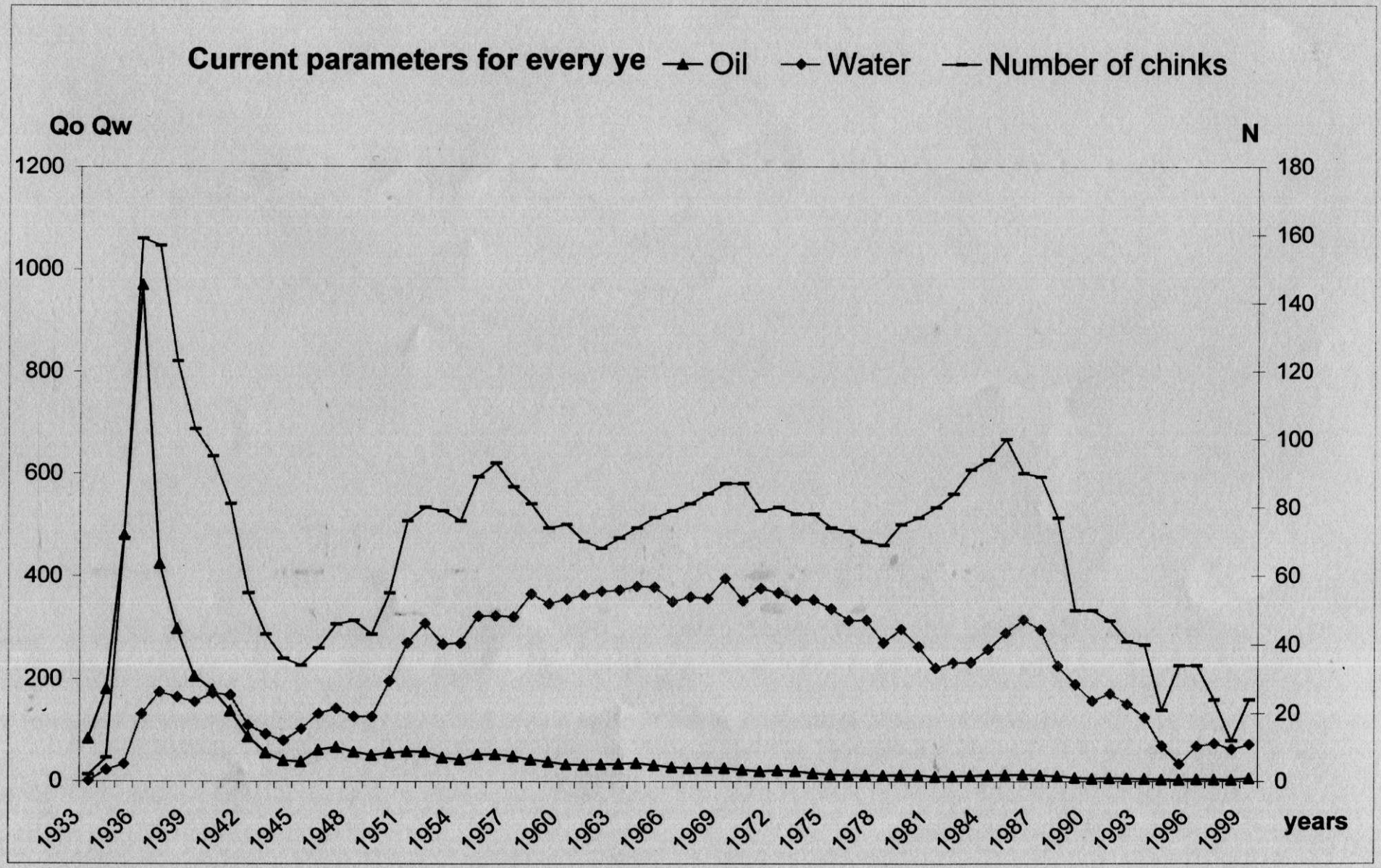
Current parameters for every ye
Oil
Water
Number of chinks
Qo Qw
N
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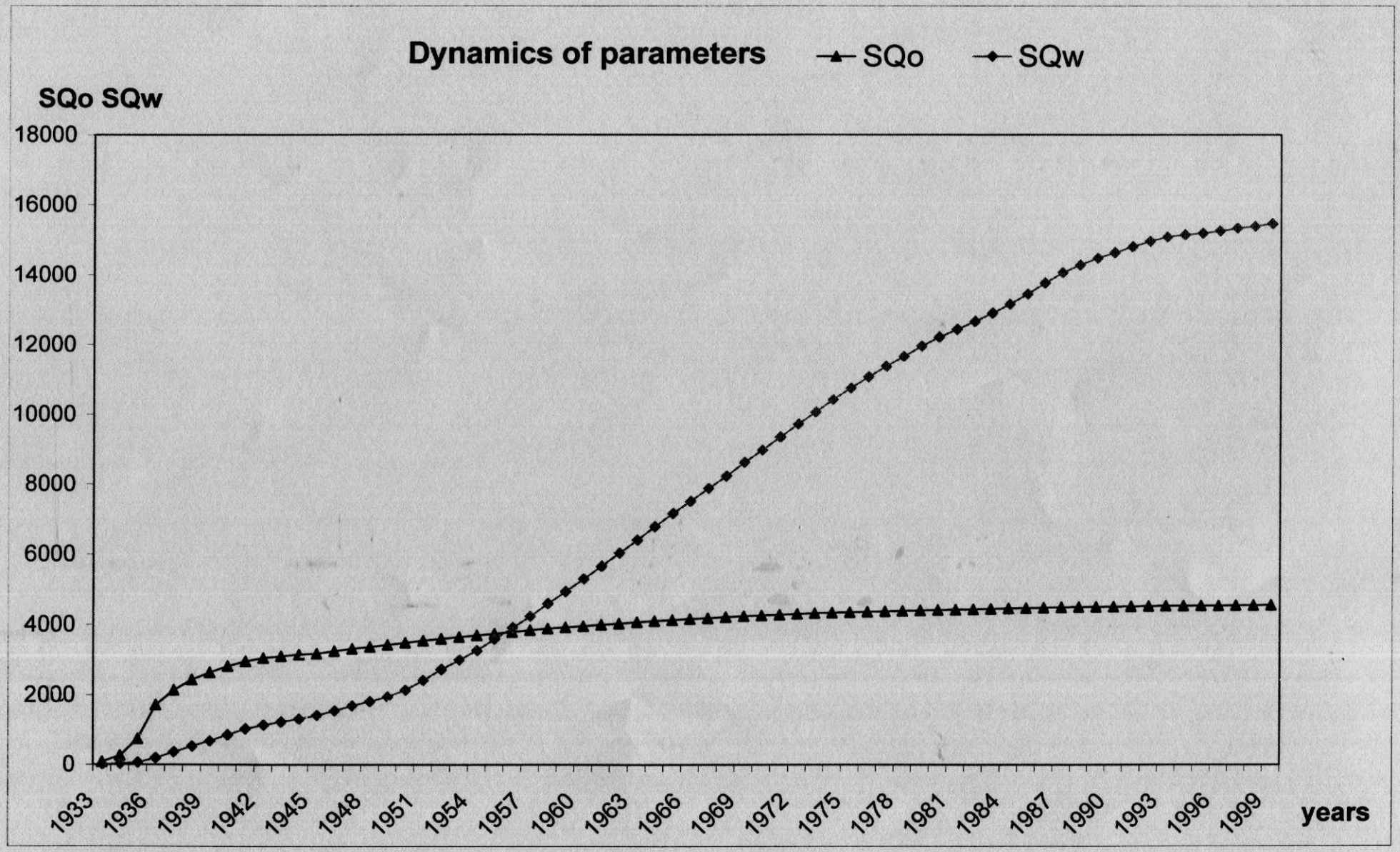
1999
years


Dynamics of parameters
SQo
SQw
SQo SQw
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1933
1936
1939
1942
1945
1948
1951
1954
1957
1960
1963
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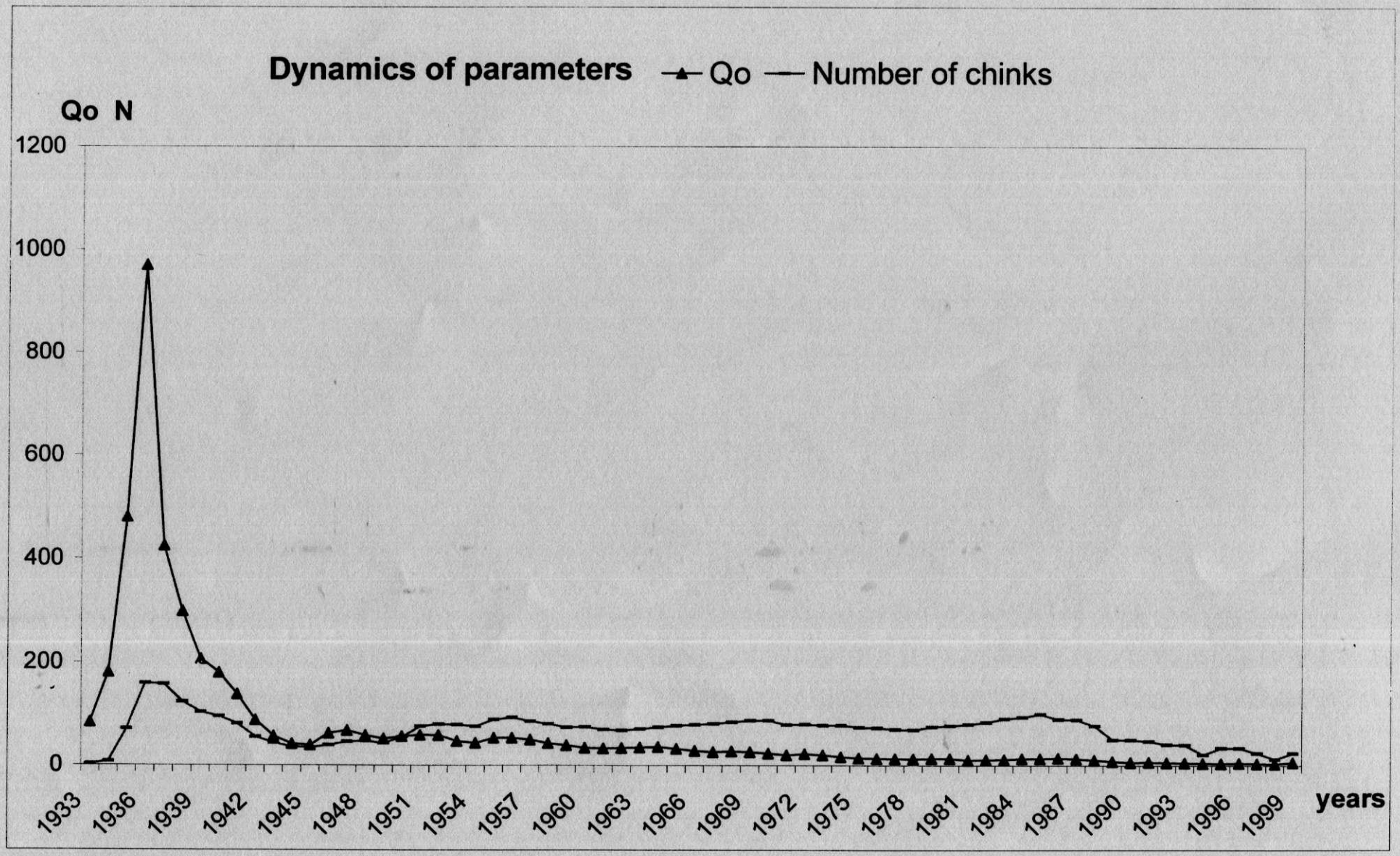
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
years


Dynamics of parameters
Qo
Number of chinks
Qo N
1200
1000
800
600
400
200
0
1933
1936
1939
1942
1945
1948
1951
1954
1957
1960
1963
1966
1969
1972
1975
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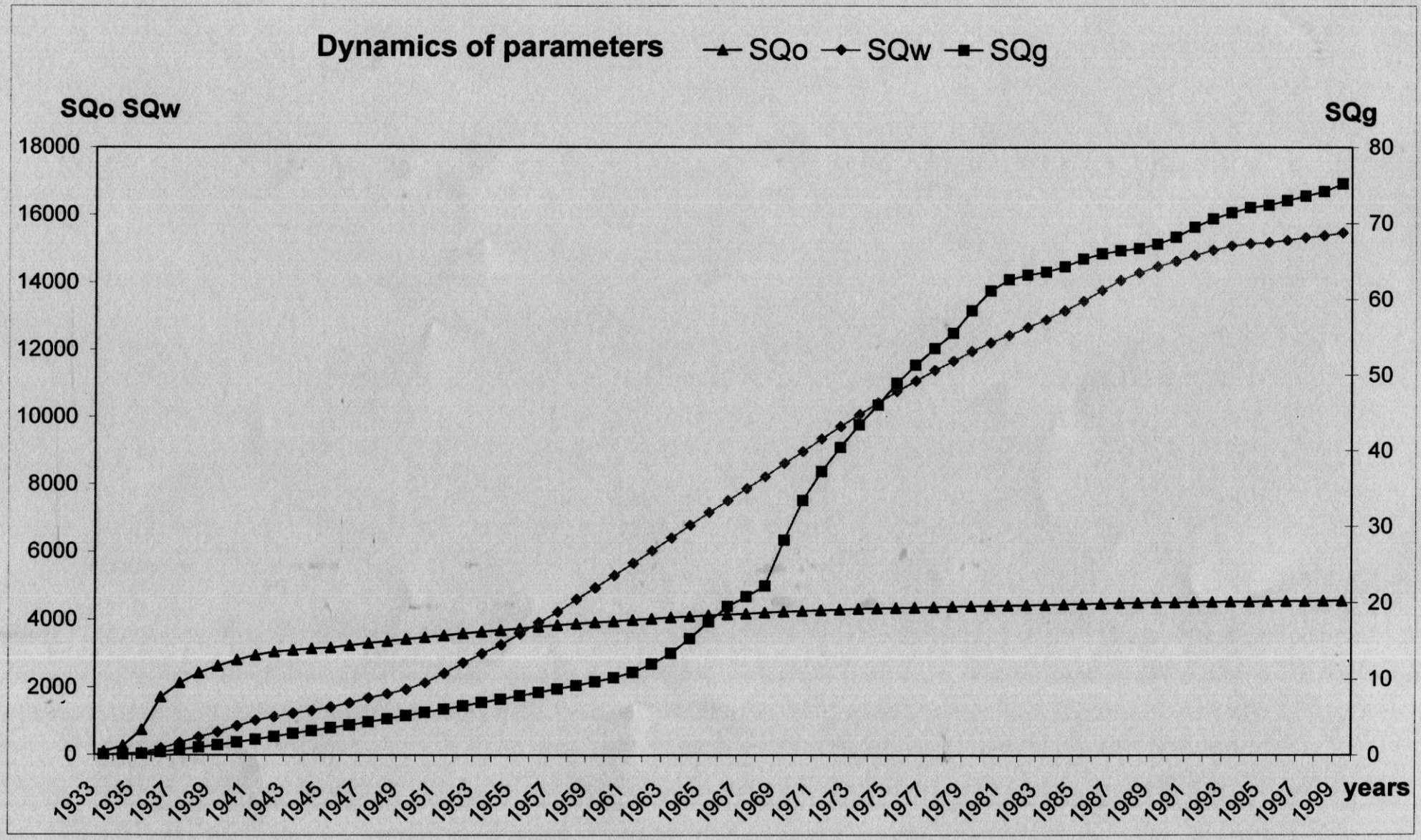
1981
1984
1987
1990
1993
1996
1999
years


Dynamics of parameters
SQo
SQw
SQg
SQo SQw
SQg
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16000
14000
12000
10000
8000
6000
4000
2000
0
80
70
60
50
40
30
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10
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1933
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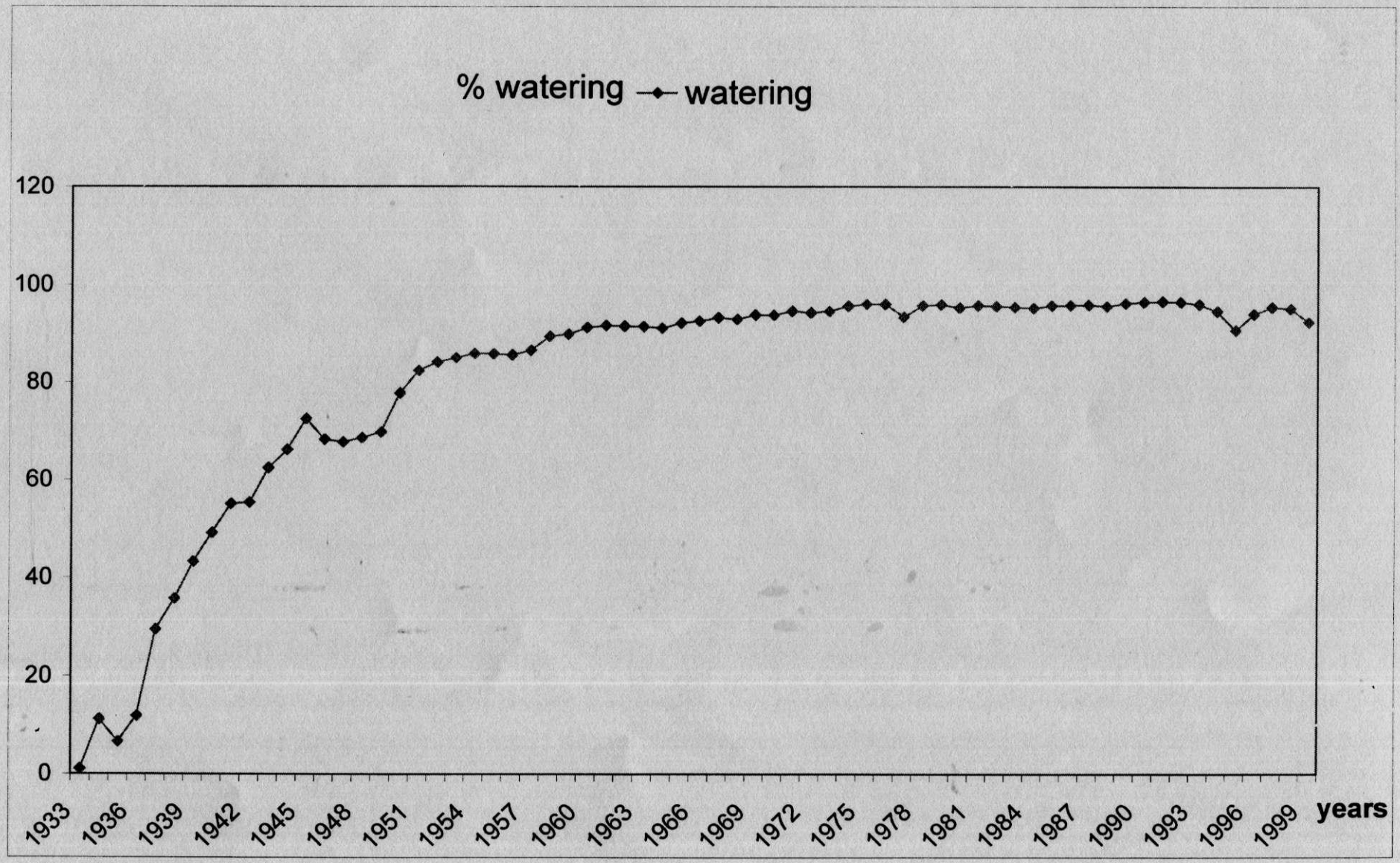
% watering
watering
120
100
80
60
40
20
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1933
1936
1939
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years

3. Forecasting of an oil recovery and calculation of stocks by a method Evolutionary modeling.

The above mentioned approach of modeling of process of the oil extracting, taking into account evolution of layer system during oil of extraction, allows more proved to approach to a task of the forecast of technological parameters of oil extracting at the retrospective analysis of efficiency of used system of development. The offered technique of division of dynamics on separate stages of development enables to limit precisely enough characteristic for evolution of layer system, time intervals which should be taken for a basis at forecasting oil extracting.

Let's consider an opportunity of application of the given approach, to the forecast of the saved up oil recovery

II horizon, deposit Kala.

For carrying out of the forecast of oil extracting, the method of evolutionary modeling is used, taking into account thus dynamics of parameters of oil extracting.

One of the basic of criterion of elections of operational objects for carrying out on them of a various kind of geology-technical actions, in particular, return of chinks, is an estimation of residual taken stocks of hydrocarbons.

One of the most widespread and effective ways of the analysis of a condition and the control of development of oil deposits is mathematical modeling the basic parameters of development. In particular, wide application mathematical models of growth of parameters have found the oil extracting allowing on the basis of integrated characteristics, to diagnose prominent features of processes of development, to give qualitative and quantitative forecasts of the basic parameters of development and to define the most expedient further decisions.

Practical experience of process of extraction it is long developed oil-and-gas deposits shows, that at the certain stage of development, the most authentic forecasts of taken stocks, it is possible to receive application of evolutionary model.

At such approach the oil pool is considered, as the complex system consisting of lines of subsystems which process of growth has evolutionary character which course is defined by set of characteristics of subsystems and a complex of external influences as a whole on system.

During oil extracting by such factors can be: change of layer pressure, change of fund of chinks, watering, various kinds of influence on a layer, etc.

Under influence of the above-stated factors, curves of growth of parameters of development can have the various character determined by a degree of influence of set of all factors on process of oil extracting which can be described on the basis of evolutionary model of a kind:

$$Q_{н.нак.} = A + B * e^{\alpha t} \qquad (1)$$

Where A, B,α - factors of model at a considered stage of the characteristic of growth, t - years of development, $Q_{н.нак.}$ - size of the saved up selection of oil, at $t \to \infty$, $Q_{н.нак.} \to A$ - taken stocks of oil in a deposit.

Procedure of calculation of taken stocks by a method of evolutionary modeling will consist of two stages.

At the first investigation phase the analysis of the initial information (an interval of training) is carried out and the forecast for the subsequent available site curve (an interval of examination) is made. By the disperse analysis of the actual and settlement data of selection, the most authentic kind of model is defined.

At the following stage, on the basis of evolutionary model with the factors determined above A, B and α the forecast of the saved up selection and definition of a taken stock of oil, under condition of an invariance of parameters of system of development further is made.

Evolutionary modeling of growth of an oil recovery and application of the disperse analysis had been determined parameters of models, with a sufficient degree of the accuracy, describing behavior of system.

As an information file sizes of the saved up oil recovery, as a whole on horizon which are submitted in table 1 have been used.

On table 2, on diagram 1 curve of the saved up oil and water are shown.

Table 2

YEARS	EXTRACTION FOR A YEAR (THOUSAND TONE)			% WATERING	QUANTITY OF CHINKS IN OPERATION	EXTRACTION OF GAS (MILLION M^3) FOR A YEAR	EXTRACTION FROM THE BEGINNING OF DEVELOPMENT		
	OIL	WATER	LIQUID				OIL (THOUSAND TON)	WATER (THOUSAND TON)	GAS (THOUSAND ON)
1933	84	1	85	1,1	2	0,01	84	1	0,01
1934	181	23	20,4	11,2	7	0,03	265	24	0,04
1935	479,9	34	513	6,6	71	0,09	744,9	58	0,13
1936	970	132	1102	11,9	159	0,26	1714,9	190	0,39
1937	424,4	175	592	29,5	157	0,29	2139,4	365	0,68
1938	298	165	462	35,7	123	0,32	2433,4	530	1
1939	205,6	156	361	43,2	103	0,34	2638,6	686	1,34
1940	179,3	172	350	49,1	95	0,36	2817,3	858	1,7
1941	137,8	169	307	55	81	0,37	2955,7	1027	2,07
1942	876	110	198	55,3	55	0,37	3049,3	1137	2,44
1943	56,4	93	149	62,4	43	0,37	3099,7	1230	2,81
1944	41,3	80	121	66,1	36	0,38	3144,0	1310	3,19
1945	38,9	103	142	72,5	34	0,38	3170,7	1413	3,57
1946	62	133	195	68,2	39	0,39	3241,7	1546	3,96
1947	67,7	143	211	67,7	46	0,4	3309,4	1689	4,36
1948	58,2	127	185	68,6	47	0,41	3363,6	1816	4,77
1949	51,7	127	182	69,7	43	0,42	3422,3	1943	5,19
1950	56,3	196	252	77,7	55	0,42	3478,6	2139	5,61
1951	59	270	336	82,4	76	0,43	3537,9	2416	6,04
1952	58,6	308	366	84,1	80	0,44	3595,8	2724	6,48
1953	47,1	268	315	85	79	0,44	3642,9	2992	6,92
1954	43,6	270	314	85,9	76	0,45	3694,5	3262	7,37
1955	53,5	322	375	85,8	89	0,45	3740,0	3585	7,82
1956	53,6	323	377	85,6	93	0,45	3793,6	3908	8,27
1957	50	321	371	86,5	86	0,45	3843,6	4229	8,72
1958	43	365	408	89,4	81	0,46	3886,6	4594	9,18
1959	39	346	385	89,8	74	0,49	3925,6	4940	9,67
1960	34	355	388	91,2	75	0,53	3952,6	5295	10,2
1961	33	363	396	91,6	70	0,7	3992,6	5658	10,9
1962	34	370	404	91,5	68	1,1	4026,6	6028	12
1963	35	372	407	91,4	71	1,4	4067,6	6400	13,4
1964	36	380	416	91,1	74	1,9	4097,6	6780	15,3
1965	32	378	410	92,1	77	2,2	4129,6	7158	17,5
1966	28	350	378	92,5	79	2	4157,6	7508	19,5
1967	26	359	385	93,2	81	1,3	4178,2	7867	20,8
1968	27	356	383	92,9	84	1,4	4210,6	8223	22,2
1969	26	395	421	93,8	87	6	4236,6	8618	28,2
1970	23	352	375	93,8	87	5,2	4259,6	8970	33,4
1971	20	376	396	94,6	79	3,8	4279,6	9346	37,2
1972	22	367	389	94,3	80	3,2	4301,6	9713	40,4
1973	20	354	374	94,6	78	3	4321,6	10067	43,4
1974	16,2	354	370,2	95,6	78	2,6	4337,8	10421	46
1975	14	336	350	96	74	2,9	4351,8	10757	48,9
1976	13	314	327	96	73	2,4	4364,8	11071	51,3
1977	12,5	314	326,5	93,4	70	2,2	4377,3	11385	53,5
1978	12	271	283	95,7	69	2	4389,3	11656	55,5
1979	13	297	310	95,9	75	3	4402,3	11953	58,5
1980	13	263	276	95,3	77	2,6	4415,3	12216	61,1
1981	9,9	222	231,9	95,7	80	1,5	4424,2	12438	62,6
1982	10,7	232	242,7	95,6	84	0,6	4435,9	12670	63,2
1983	11,3	233	244,3	95,4	91	0,4	4447,2	12903	63,6
1984	13	258	271	95,2	94	0,7	4460,2	13161	64,3
1985	13	290	303	95,7	100	1	4472,2	13451	65,3
1986	13,8	315	328,8	95,8	90	0,7	4480,4	13766	66
1987	12,6	296	308,6	95,9	89	0,4	4493	14062	66,4
1988	10,5	226	236,5	95,6	77	0,3	4503,5	14288	66,7
1989	7,4	190	197,4	96,2	50	0,6	4510,9	14478	67,3
1990	5,6	158	163,6	96,5	50	0,9	4513,5	14636	68,2
1991	6,3	172	178,3	96,6	47	1,3	4522,8	14808	69,5
1992	5,5	151,7	157,2	96,5	41	1,1	4528,3	14959,7	70,6
1993	5,1	125,2	130,3	96	40	0,8	4533,4	15084,9	71,4
1994	3,9	69,4	73,3	94,6	21	0,7	4537,3	15154,3	72,1
1995	3,5	34,5	38	90,7	34	0,3	4540,8	15188,8	72,4
1996	4,4	69,2	73,6	94	34	0,6	4545,2	15258	73
1997	3,6	74,9	78,5	95,4	24	0,6	4548,9	15332,9	73,6
1998	3,2	63	66,2	95,1	12	0,6	4551,8	15395,9	74,2
1999	6	72,2	78,2	92,3	24	1	4557,8	15468,1	75,2

Calculation of factors of the equation (1) is made as follows.

For each rectilinear site of dependence and according to the certain stage of development, factors A, B and α under the following formulas pay off:

$$\alpha = 2 \ln [(y_2-y_1)/(y_3-y_2)] / (t_1-t_3) \qquad (2)$$

$$A = Q_{н.извл.} = y_1-*y_3-y_2^2/y_1+y_3-2y_2 \qquad (3)$$

$$B = y_2-A / e^{\alpha t}{}_2 \qquad (4)$$

Where t_1, t_2, t_3 - correspond to sizes of development, for each stage of development.

$t_2 = (t_1+ t_3) / 2$, at t_1.corresponds to the beginning of a stage, t_3.corresponds to the end of a stage.

y_1, y_2, y_3 - corresponding t_1, t_2, t_3.values of the saved up selection of oil.

As the equation (1) size of factor has been marked above A, corresponds to size of taken stocks on horizon. The equation used in calculations is below resulted. It is identical to the equation (1).

$$Y_i = Q_{н.нак.} = A + B * e^{\alpha t}{}_i \qquad (5)$$

Where α - the factor corresponding to factor α in the equation (1),

Y_i - corresponds $Q_{н.нак.}$ (thousand ton), t_i - corresponds t (years), i - years of development.

Results of calculations are shown in the following table 3.

Table 3

YEAR	OIL (mt)	WATER (mt)	GAS (mm scm)	OIL ev (mt)	WATER ev (mt)	GAS ev (mm scm)
1933	84	1	0,01	1628,347	-6158027	-895,5179
1934	265	24	0,04	1792,652	-5284811	-817,3491
1935	744,9	58	0,13	1947,981	-4535103	-745,458
1936	1714,9	190	0,39	2094,824	-3891435	-679,3405
1937	2139,4	365	0,68	2233,644	-3338808	-618,5329
1938	2433,4	530	1	2364,881	-2864346	-562,6087
1939	2638,6	686	1,34	2488,947	-2456992	-511,1758
1940	2817,3	858	1,7	2606,235	-2107255	-463,8735
1941	2955,7	1027	2,07	2717,116	-1806985	-420,3701
1942	3049,3	1137	2,44	2821,939	-1549186	-380,3604
1943	3099,7	1230	2,81	2921,035	-1327850	-343,5639
1944	3144	1310	3,19	3014,718	-1137820	-309,7225
1945	3170,7	1413	3,57	3103,282	-974668,8	-278,5989
1946	3241,7	1546	3,96	3187,007	-834593,6	-249,9748
1947	3309,4	1689	4,36	3266,159	-714330,8	-223,6496
1948	3363,6	1816	4,77	3340,986	-611078,1	-199,4385
1949	3422,3	1943	5,19	3411,725	-522429,7	-177,1719
1950	3478,6	2139	5,61	3478,6	-446319,8	-156,6934
1951	3537,9	2416	6,04	3541,821	-380975	-137,8596
1952	3595,8	2724	6,48	3601,588	-324872,7	-120,5383
1953	3642,9	2992	6,92	3658,09	-276705,5	-104,6081
1954	3694,5	3262	7,37	3711,505	-235351,2	-89,95729
1955	3740	3585	7,82	3762,002	-199846,1	-76,48306
1956	3793,6	3908	8,27	3809,74	-169362,9	-64,09094
1957	3843,6	4229	8,72	3854,87	-143191,3	-52,69403
1958	3886,6	4594	9,18	3897,534	-120721,4	-42,21241
1959	3925,6	4940	9,67	3937,868	-101429,7	-32,57257
1960	3952,6	5295	10,2	3975,998	-84866,65	-23,70691
1961	3992,6	5658	10,9	4012,045	-70646,3	-15,55324
1962	4026,6	6028	12	4046,122	-58437,29	-8,054401
1963	4067,6	6400	13,4	4078,338	-47955,14	-1,157791
1964	4097,6	6780	15,3	4108,794	-38955,61	5,184952
1965	4129,6	7158	17,5	4137,586	-31228,98	11,01831
1966	4157,6	7508	19,5	4164,804	-24595,21	16,38319
1967	4178,2	7867	20,8	4190,536	-18899,74	21,31722
1968	4210,6	8223	22,2	4214,862	-14009,84	25,85499
1969	4236,6	8618	28,2	4237,859	-9811,571	30,02834
1970	4259,6	8970	33,4	4259,6	-6207,114	33,86652
1971	4279,6	9346	37,2	4280,153	-3112,477	37,39646
1972	4301,6	9713	40,4	4299,583	-455,55	40,64291
1973	4321,6	10067	43,4	4317,951	1825,5778	43,62864
1974	4337,8	10421	46	4335,316	3784,0597	46,37458
1975	4351,8	10757	48,9	4351,733	5465,5311	48,9
1976	4364,8	11071	51,3	4367,252	6909,1728	51,2226
1977	4377,3	11385	53,5	4381,924	8148,6238	53,35867
1978	4389,3	11656	55,5	4395,794	9212,7651	55,3232
1979	4402,3	11953	58,5	4408,906	10126,393	57,12995
1980	4415,3	12216	61,1	4421,302	10910,796	58,7916
1981	4424,2	12438	62,6	4433,021	11584,251	60,31981
1982	4435,9	12670	63,2	4444,099	12162,453	61,72528

1983	4447,2	12903	63,6	4454,572	12658,872	63,01789
1984	4460,2	13161	64,3	4464,473	13085,078	64,20668
1985	4472,2	13451	65,3	4473,834	13451	65,3
1986	4480,4	13766	66	4482,682	13765,166	66,30552
1987	4493	14062	66,4	4491,048	14034,895	67,23028
1988	4503,5	14288	66,7	4498,956	14266,474	68,08077
1989	4510,9	14478	67,3	4506,432	14465,298	68,86297
1990	4513,5	14636	68,2	4513,5	14636	69,58234
1991	4522,8	14808	69,5	4520,182	14782,558	70,24394
1992	4528,3	14959,7	70,6	4526,498	14908,386	70,85241
1993	4533,4	15084,9	71,4	4532,47	15016,417	71,41201
1994	4537,3	15154,3	72,1	4538,115	15109,168	71,92667
1995	4540,8	15188,8	72,4	4543,452	15188,8	72,4
1996	4545,2	15258	73	4548,497	15257,169	72,83531
1997	4548,9	15332,9	73,6	4553,267	15315,867	73,23567
1998	4551,8	15395,9	74,2	4557,776	15366,264	73,60387
1999	4557,8	15468,1	75,2	4562,039	15409,532	73,9425

Table 4

Year	OIL (mt)
1950	3478,6
1970	4259,6
1990	4513,5

Table 4a

a	4635,80167
b	-4,38805E+50
c	-0,056181733

Table 5

Year	WATER (mt)
1985	13451
1990	14636
1995	15188,8

Table 5a

a	15672,1721
b	-6,5052E+134
c	-0,152500356

Table 6

Year	GAS (mm scm)
1975	48,9
1985	65,3
1995	72,4

Table 6a

a	77,82043011
b	-1,85926E+73
c	-0,083718655

For oil

The values t_1,t_2 and t_3,can be found in table(4a) for oil case, which were chosen for 1950,1970 and 1990years.Using initial data in table 1,for the equations (2),(3) and (4) the factors α,a and b,were calculated for oil case, see table (2b).Then these factors α,a and b,were used in equation (5),for forecasting oil production till 2025.These results are shown in table (7).

For water

The values t_1,t_2 and t_3,can be found in table(5a) for water case, which were chosen for 1985,1990 and 1995years.Using initial data in table 1,for the equations (2),(3) and (4) the factors α,a and b,were calculated for water case, see table (3b).Then these factors α,a and b,were used in equation (5),for forecasting water production till 2025.These results are shown in table (7).

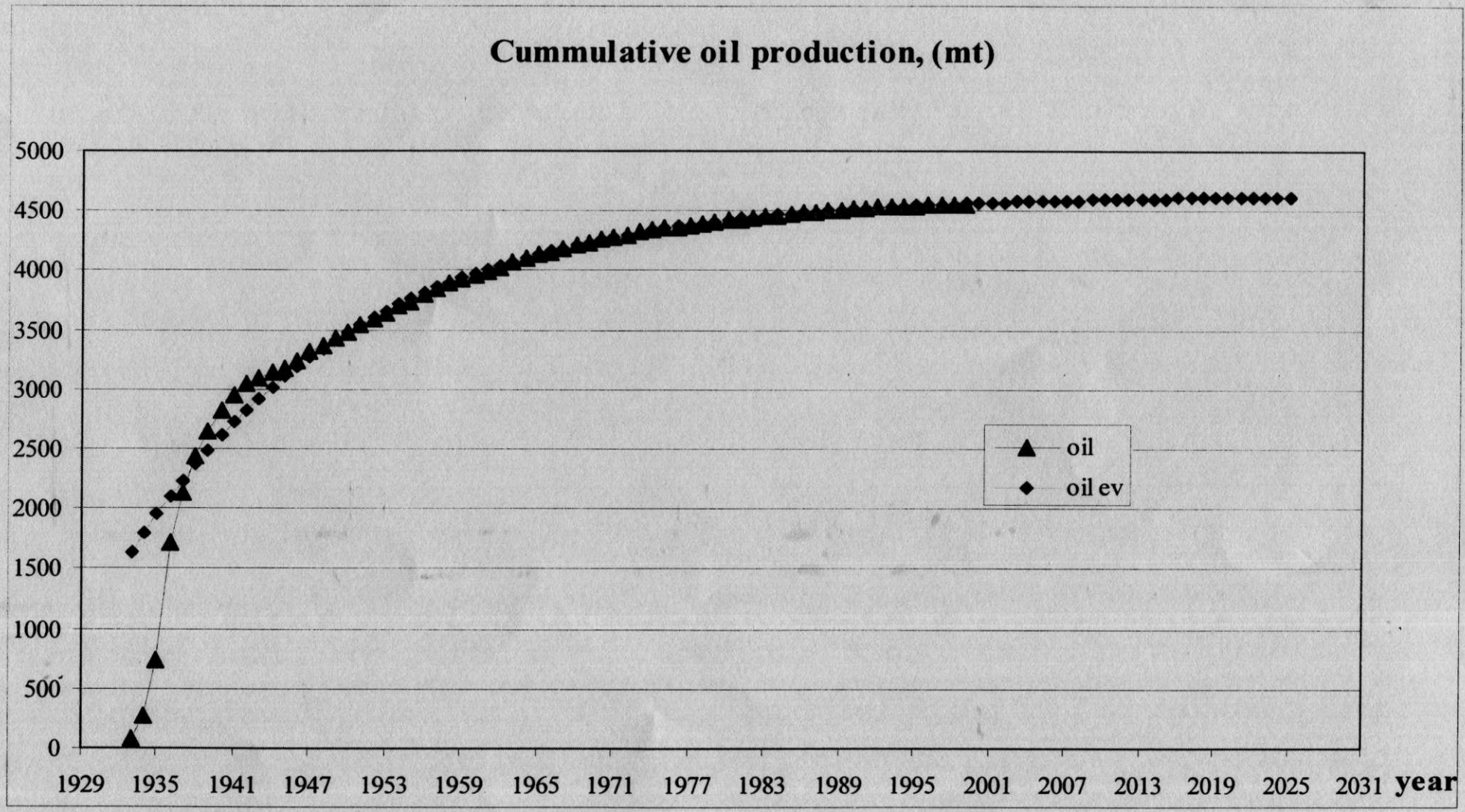
For gas

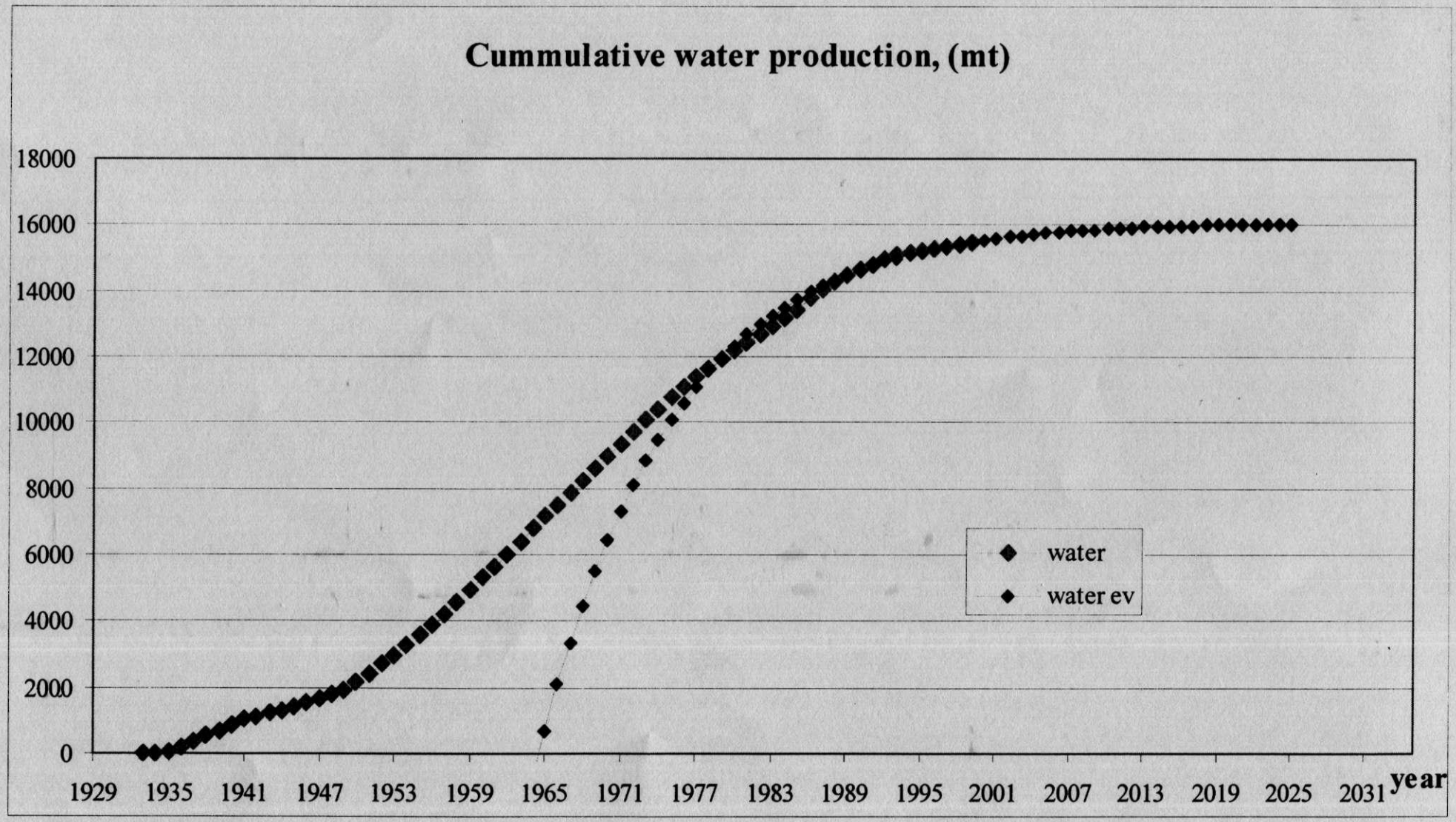
The values t_1,t_2 and t_3,can be found in table(6a) for gas case, which were chosen for 1975,1985 and 1995years.Using initial data in table 1,for the equations (2),(3) and (4) the factors α,a and b,were calculated for gas case, see table (4b).Then these factors α,a and b,were used in equation (5),for forecasting gas production till 2025.These results are shown in table (7).

Table 7

YEAR	OIL (mt)	WATER (mt)	GAS (mm scm)	OIL ev (mt)	WATER ev (mt)	GAS ev (mm scm)
1933	84	1	0,01	1628,3467	-6158027	-895,51794
1934	265	24	0,04	1792,652	-5284811	-817,34911
1935	744,9	58	0,13	1947,9809	-4535103	-745,45801
1936	1714,9	190	0,39	2094,8238	-3891435	-679,3405
1937	2139,4	365	0,68	2233,6442	-3338808	-618,53288
1938	2433,4	530	1	2364,8805	-2864346	-562,60873
1939	2638,6	686	1,34	2488,9471	-2456992	-511,17584
1940	2817,3	858	1,7	2606,2355	-2107255	-463,87353
1941	2955,7	1027	2,07	2717,1161	-1806985	-420,37007
1942	3049,3	1137	2,44	2821,9391	-1549186	-380,36038
1943	3099,7	1230	2,81	2921,0353	-1327850	-343,56386
1944	3144	1310	3,19	3014,7175	-1137820	-309,72248
1945	3170,7	1413	3,57	3103,2817	-974668,8	-278,5989
1946	3241,7	1546	3,96	3187,0074	-834593,6	-249,97485
1947	3309,4	1689	4,36	3266,1589	-714330,8	-223,6496
1948	3363,6	1816	4,77	3340,9862	-611078,1	-199,43853
1949	3422,3	1943	5,19	3411,7254	-522429,7	-177,17186
1950	3478,6	2139	5,61	3478,6	-446319,8	-156,69342
1951	3537,9	2416	6,04	3541,821	-380975	-137,85961
1952	3595,8	2724	6,48	3601,5881	-324872,7	-120,53834
1953	3642,9	2992	6,92	3658,09	-276705,5	-104,60814
1954	3694,5	3262	7,37	3711,505	-235351,2	-89,957293
1955	3740	3585	7,82	3762,0018	-199846,1	-76,483059
1956	3793,6	3908	8,27	3809,7398	-169362,9	-64,090941
1957	3843,6	4229	8,72	3854,8698	-143191,3	-52,694035
1958	3886,6	4594	9,18	3897,5342	-120721,4	-42,212414
1959	3925,6	4940	9,67	3937,8678	-101429,7	-32,572573
1960	3952,6	5295	10,2	3975,9978	-84866,65	-23,706907
1961	3992,6	5658	10,9	4012,0446	-70646,3	-15,553244
1962	4026,6	6028	12	4046,1221	-58437,29	-8,0544011
1963	4067,6	6400	13,4	4078,3379	-47955,14	-1,1577909
1964	4097,6	6780	15,3	4108,7937	-38955,61	5,1849525
1965	4129,6	7158	17,5	4137,5855	-31228,98	11,01831
1966	4157,6	7508	19,5	4164,8044	-24595,21	16,38319
1967	4178,2	7867	20,8	4190,5362	-18899,74	21,317217
1968	4210,6	8223	22,2	4214,8623	-14009,84	25,854992
1969	4236,6	8618	28,2	4237,8593	-9811,571	30,028337
1970	4259,6	8970	33,4	4259,6	-6207,114	33,866522
1971	4279,6	9346	37,2	4280,1529	-3112,477	37,396462
1972	4301,6	9713	40,4	4299,583	-455,55	40,642912
1973	4321,6	10067	43,4	4317,9515	1825,5778	43,628639
1974	4337,8	10421	46	4335,3165	3784,0597	46,374583
1975	4351,8	10757	48,9	4351,7328	5465,5311	48,9
1976	4364,8	11071	51,3	4367,2522	6909,1728	51,222601
1977	4377,3	11385	53,5	4381,9238	8148,6238	53,358673
1978	4389,3	11656	55,5	4395,7939	9212,7651	55,323198
1979	4402,3	11953	58,5	4408,9061	10126,393	57,129951
1980	4415,3	12216	61,1	4421,302	10910,796	58,791604
1981	4424,2	12438	62,6	4433,0207	11584,251	60,31981
1982	4435,9	12670	63,2	4444,0992	12162,453	61,725285

1983	4447,2	12903	63,6	4454,5724	12658,872	63,017887
1984	4460,2	13161	64,3	4464,4735	13085,078	64,206679
1985	4472,2	13451	65,3	4473,8336	13451	65,3
1986	4480,4	13766	66	4482,6823	13765,166	66,305516
1987	4493	14062	66,4	4491,0476	14034,895	67,230279
1988	4503,5	14288	66,7	4498,9559	14266,474	68,080775
1989	4510,9	14478	67,3	4506,4322	14465,298	68,862967
1990	4513,5	14636	68,2	4513,5	14636	69,582341
1991	4522,8	14808	69,5	4520,1817	14782,558	70,243942
1992	4528,3	14959,7	70,6	4526,4983	14908,386	70,85241
1993	4533,4	15084,9	71,4	4532,4698	15016,417	71,412012
1994	4537,3	15154,3	72,1	4538,1151	15109,168	71,926672
1995	4540,8	15188,8	72,4	4543,452	15188,8	72,4
1996	4545,2	15258	73	4548,4973	15257,169	72,835315
1997	4548,9	15332,9	73,6	4553,267	15315,867	73,23567
1998	4551,8	15395,9	74,2	4557,7761	15366,264	73,603872
1999	4557,8	15468,1	75,2	4562,0388	15409,532	73,942504
2000				4566,0687	15446,68	74,25394
2001				4569,8784	15478,574	74,540365
2002				4573,48	15505,957	74,803787
2003				4576,8848	15529,466	75,046054
2004				4580,1035	15549,651	75,268864
2005				4583,1465	15566,981	75,47378
2006				4586,0232	15581,859	75,66224
2007				4588,7427	15594,633	75,835564
2008				4591,3137	15605,6	75,994969
2009				4593,7442	15615,016	76,141572
2010				4596,0419	15623,1	76,276401
2011				4598,2141	15630,041	76,400402
2012				4600,2676	15636	76,514444
2013				4602,2089	15641,116	76,619328
2014				4604,0442	15645,509	76,715789
2015				4605,7792	15649,28	76,804503
2016				4607,4194	15652,518	76,886092
2017				4608,97	15655,298	76,961128
2018				4610,4359	15657,685	77,030139
2019				4611,8217	15659,734	77,093607
2020				4613,1318	15661,493	77,151978
2021				4614,3703	15663,004	77,205662
2022				4615,5411	15664,3	77,255034
2023				4616,648	15665,414	77,300441
2024				4617,6944	15666,37	77,342201
2025				4618,6837	15667,19	77,380608


Cummulative oil production, (mt)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1929
1935
1941
1947
1953
1959
1965
1971
1977
1983
1989
1995
2001
2007
2013
2019
2025
2031
year
oil
oil ev


Cummulative water production, (mt)
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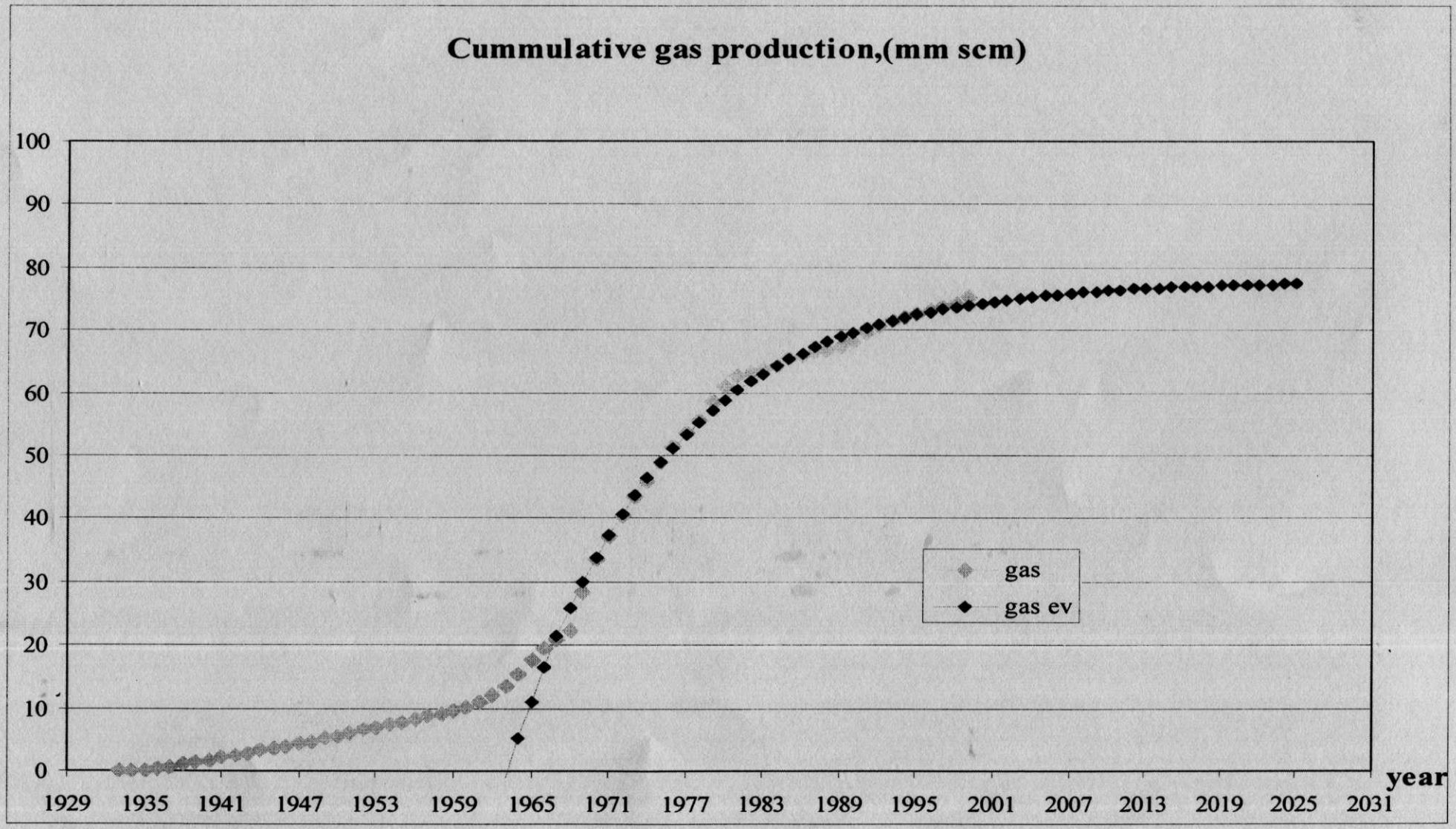
16000
14000
12000
10000
8000
6000
4000
2000
0
1929
1935
1941
1947
1953
1959
1965
1971
1977
1983
1989
1995
2001
2007
2013
2019
2025
2031
year
water
water ev


Cummulative gas production,(mm scm)
100
90
80
70
60
50
40
30
20
10
0
1929
1935
1941
1947
1953
1959
1965
1971
1977
1983
1989
1995
2001
2007
2013
2019
2025
2031
year
gas
gas ev

Processing of operational chinks by a hydrochloric acid.

Acid processing of chinks is based on ability of a hydrochloric acid, to dissolve petrocontaining carbonate strata.

In porous carbonates, the acid dissolves the brought particles littering ways of a filtration of oil and by that restores filtration ability of breed bottomhole zones. The hydrochloric acid acts clay cement and the additive of a fluoric acid deepen action of a hydrochloric acid, raises petrofeedback.

Average values carbonate on operational objects which has Petroleum and Gas Extracting Administration, are results in table 1.

Table 1

Horizon	All it is processed	% of efficiency	With a fluoric acid		Without a fluoric acid	
			All it is processed	% of efficiency	All it is processed	% of efficiency
II	22	15	9	11	13	15

Selection of chinks for acid processing.

One of the reasons of low efficiency of acid processing should consider insufficiently correct selection of chinks.

For hydrochloric acid acid processing is inadmissible to select chinks faulty columns, and also the chinks working from horizon, where residual stocks of oil and seam pressure low.

The analysis of chinks of II horizon, has shown, that it is irrational to make acid processing in strongly exhausted layers having low пластовое pressure.

Such object is II horizon on which the current operating ratio of stocks makes 0.57 %.

Besides chinks to which acid processing bottomhole zones have been lead and chinks surrounding them work on potential selection. At some chinks after acid processing, yield have remained constant (chinks №№ 657, 160, 335, 208, 425 and others). It specifies, that yield them correspond to opportunities of a layer, at the given

stage of development. Thus, influence of a hydrochloric acid on bottomhole a zone of chinks of II horizon to spend expediently and it once again proved to be true that a number of chinks after acid processing supply with water, therefore in some chinks after acid processing have made дострел or return on higher horizon.

The resulted examples confirm necessity at a choice of chinks, for hydrochloride-acid processing of careful studying not only geological -operational characteristics of chinks, but also operational object. Till 1960 almost in all cases at selection of chinks for carrying out on them of acid processing total selection of oil and water from the given object in view of associates and before working chinks was not considered.

Preparation of chinks for carrying out hydrochloride-acid processing.

The core by preparation of chinks for acid processing is cleanliness of the filter.

However in most cases by preparation of chinks for acid processing do not make gauging a face after washing chinks, and also cases when before processing the filter is partially blocked are not rare, that is not all capacity of the filter is exposed to processing. It is enough to tell, that on 45 chinks measured, before acid processing had partially blocked filter.

For maintenance of uniform processing on all capacity of the filter, and also maintenance of receipt of an acid during times of a layer with the greatest efficiency, it is necessary potting to establish pipes within the limits of the filter.

However this condition on crafts is not observed, that is the boot is established above the filter, and in some cases, even above the filter. All it substantially reduces efficiency of process.

Technology of carrying out of processing.

The technology of carrying out of the process has special value also. Process should be made on three stages:

1. Preliminary закачка oil (2-3 м^3 an oil pillow).
2. Pumping an acid solution
3. Pumping squeezing liquids (2-3 м^3 oil and the rest water).

But this technology was not maintained, as has partially affected effectiveness ratio. Infringement of technology of process also was expressed in reduction of volume of an acid solution, закачиваемого in a chink and in its conditions pumping.

Being based on acid processing of 1960 on which we have the analysis, it is established, that the quantity pumping in a chink of a hydrochloric acid within the limits of 6-10 м^3 is not enough, and it proves to be true not only results of the received gain of oil, but also that in production of a chink after their start-up undetectable the reacted hydrochloric acid. It specifies necessity of increase in volume pumping acids.

On a line of chinks the underestimated efficiency speaks absence of additives of a fluoric acid, and also carrying out of process, basically at pressure equal to zero that reduces depth of penetration of an acid and, hence, a zone of influence of process. From tables of application of a fluoric acid for chinks of the top and bottom departments of productive thickness it is visible, that on the top department as a whole efficiency of acid processing does not depend on additives of a fluoric acid.

The additive of a fluoric acid at processing chinks of horizons of the bottom department of productive thickness yields the best results.

number of well	date realization	horizon	filter	quantity acids							suspension m		av.day Q_n,Q_w t.t.		av. day. increase	total increase
				HCl M^3	HFt kg	CH_3COOH kg	HCl on 1 force metr	HFt in % к HCl	P Peening	time tenacity	to processing.	after processing.	to processing.	after processing.		
442	18IV55	II	902/932								908	905	0.9/0.5	1.2/0.7	0.3	24.8
442	13I58	II	902/932	7	83.5	80	0.2	1.2	0		879	884	0.1/-	0.7/0.2	0.6	247.3
334	15III57	II	902/926	10	-	-	0.4	-	0		887	887	0.5/-	0.2/2.7	-	-
73	1XI56	II	894/911	9	-	75	0.5	-	0	8	877	877	0.3/0.3	0.8/1.5	0.5	753.6
170	22XI56	II	935/940	12	-	50	2.4	-	0	8	933	922	-/10	-/4	-	-
52	19I59	II	941/961	7	-	-	0.4	-	0	8	935	935	0.4/9.6	0.4/10	-	-
266	22XII59	II	921/936	6	100	-	0.4	1.7	0	8	908	908	0.6/3.9	0.8/3.6	0.2	20.8
266	20IV60	II	921/936	6	100	150	0.4	1.7	0	8	-	-	0.8/3.5	1.2/3.8	0.4	71.4
1288	11II59	II	910/933	10	180	-	0.4	1.8	0	8	907	907	2/-	1.9/-	-	-
348	21I60	II	904/925	7	-	100	0.3	-	0	8	892	892	0.1/0.2	0.2/-	0.1	2.8
247	10VIII60	II	917/932	7	250	-	0.5	3.6	0	8	848	918	-/-	0.2/2.4	0.2	8.7
1166	12II60	II	938/948	7	-	-	0.7	-	0	8	927	927	0.9/0.6	1.4/4.8	0.5	149.8

Let's take, for example, a chink number 442 where on April, 18th, 1955, acid processing has been lead. In table 1, data on a chink two months before processing, and two months after processing by a hydrochloric acid are shown.

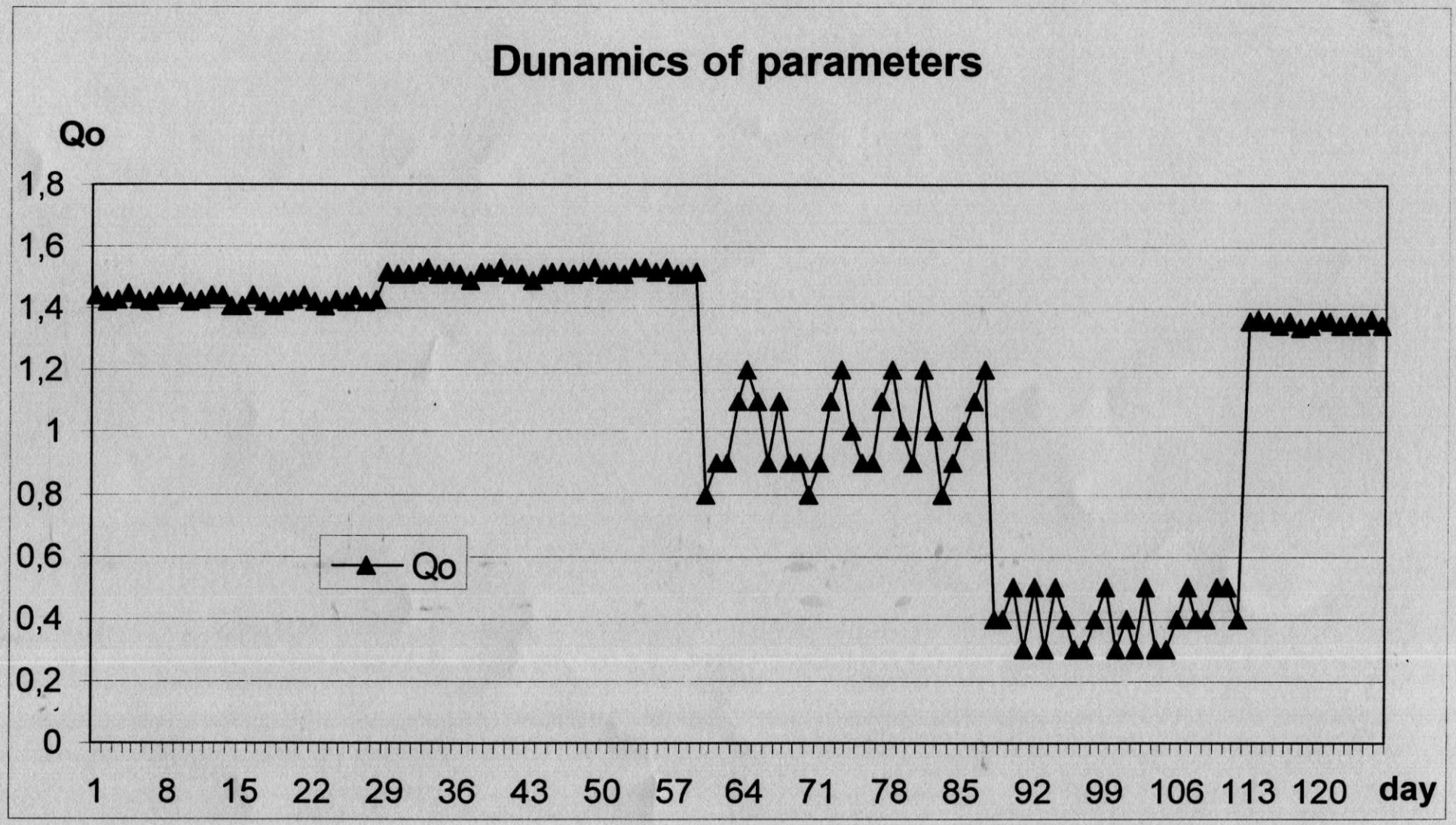
month	oil	water	days of work	average daily debit oil	average daily debit water
Y	41	14	31	1,32	0,45
F	40	18	28	1,43	0,64
M	47	14	31	1,52	0,45
A	28	18	28	1	0,64
M	10	11	25	0,4	0,44
I	19	43	14	1,36	3,07
I	35	44	31	1,13	1,42
A	27	31	31	0,87	1
S	8	26	30	0,3	0,87
O	27	18	31	0,87	0,58
N	24	14	30	0,8	0,47
D	8	11	31	0,26	0,35

days	February	March	April	May	June
1	1,44	1,52	0,8	0,4	1,36
2	1,42	1,51	0,9	0,4	1,37
3	1,43	1,51	0,9	0,5	1,36
4	1,45	1,52	1,1	0,3	1,35
5	1,43	1,53	1,2	0,5	1,36
6	1,42	1,51	1,1	0,3	1,34
7	1,44	1,52	0,9	0,5	1,35
8	1,44	1,51	1,1	0,4	1,37
9	1,45	1,49	0,9	0,3	1,36
10	1,42	1,52	0,9	0,3	1,35
11	1,43	1,52	0,8	0,4	1,36
12	1,44	1,53	0,9	0,5	1,35
13	1,44	1,51	1,1	0,3	1,37
14	1,41	1,51	1,2	0,4	1,35
15	1,41	1,49	1	0,3	-
16	1,44	1,51	0,9	0,5	-
17	1,42	1,52	0,9	0,3	-
18	1,41	1,52	1,1	0,3	-
19	1,42	1,51	1,2	0,4	-
20	1,43	1,52	1	0,5	-
21	1,44	1,53	0,9	0,4	-
22	1,42	1,51	1,2	0,4	-
23	1,41	1,52	1	0,5	-
24	1,43	1,51	0,8	0,5	-
25	1,42	1,53	0,9	0,4	-
26	1,44	1,53	1	-	-
27	1,42	1,52	1,1	-	-
28	1,43	1,53	1,2	-	-
29	-	1,51	-	-	-
30	-	1,51	-	-	-
31	-	1,52	-	-	-
total	40	47	28	10	19

Using data from table 1, we shall construct schedules of parameters Qo and ΣQo, also we shall look that at us it will turn out.

Daily allowances flow rate oil

day	Q_o	day	Q_o	day	Q_o	day	Q_o
1	1.44	37	1.49	73	1.2	109	0.4
2	1.42	38	1.52	74	1	110	0.5
3	1.43	39	1.52	75	0.9	111	0.5
4	1.45	40	1.53	76	0.9	112	0.4
5	1.43	41	1.51	77	1.1	113	1.36
6	1.42	42	1.51	78	1.2	114	1.37
7	1.44	43	1.49	79	1	115	1.36
8	1.44	44	1.51	80	0.9	116	1.35
9	1.45	45	1.52	81	1.2	117	1.36
10	1.42	46	1.52	82	1	118	1.34
11	1.43	47	1.51	83	0.8	119	1.35
12	1.44	48	1.52	84	0.9	120	1.37
13	1.44	49	1.53	85	1	121	1.36
14	1.41	50	1.51	86	1.1	122	1.35
15	1.41	51	1.52	87	1.2	123	1.36
16	1.44	52	1.51	88	0.4	124	1.35
17	1.42	53	1.53	89	0.4	125	1.37
18	1.41	54	1.53	90	0.5	126	1.35
19	1.42	55	1.52	91	0.3		
20	1.43	56	1.53	92	0.5		
21	1.44	57	1.51	93	0.3		
22	1.42	58	1.51	94	0.5		
23	1.41	59	1.52	95	0.4		
24	1.43	60	0.8	96	0.3		
25	1.42	61	0.9	97	0.3		
26	1.44	62	0.9	98	0.4		
27	1.42	63	1.1	99	0.5		
28	1.43	64	1.2	100	0.3		
29	1.52	65	1.1	101	0.4		
30	1.51	66	0.9	102	0.3		
31	1.51	67	1.1	103	0.5		
32	1.52	68	0.9	104	0.3		
33	1.53	69	0.9	105	0.3		
34	1.51	70	0.8	106	0.4		
35	1.52	71	0.9	107	0.5		
36	1.51	72	1.1	108	0.4		


Dunamics of parameters
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1,2
1
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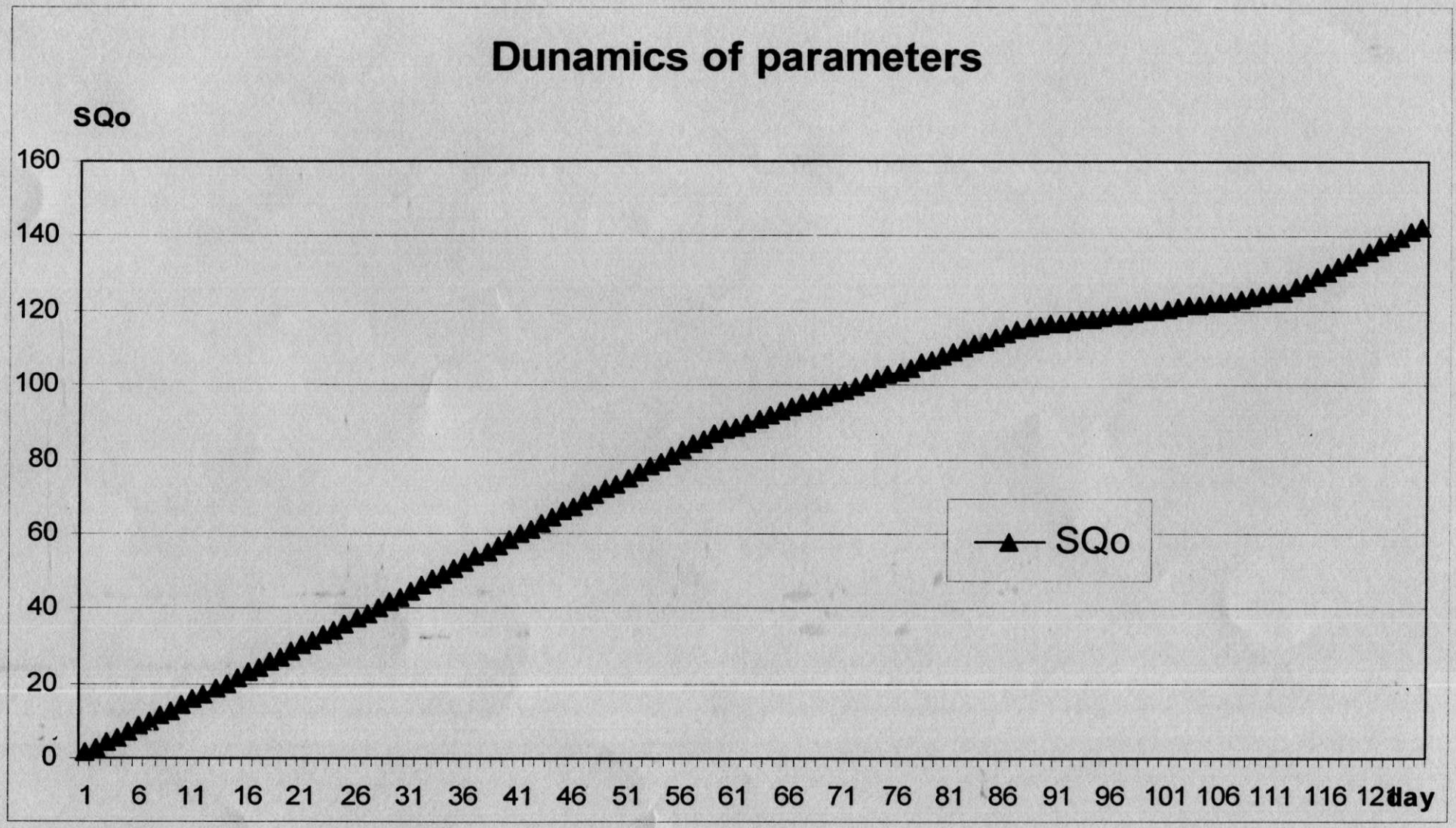
0,6
0,4
0,2
0
Qo
1
8
15
22
29
36
43
50
57
64
71
78
85
92
99
106
113
120
day

Total flow rate oil

day	ΣQ_o	day	ΣQ_o	day	ΣQ_o	day	ΣQ_o
1	1.44	37	53.62	73	100.8	109	123.6
2	2.86	38	55.14	74	101.8	110	124.1
3	4.29	39	56.66	75	102.7	111	124.6
4	5.74	40	58.19	76	103.6	112	125
5	7.17	41	59.7	77	104.7	113	126.36
6	8.59	42	61.21	78	105.9	114	127.73
7	10.03	43	62.7	79	106.9	115	129.09
8	11.47	44	64.21	80	107.8	116	130.44
9	12.92	45	65.73	81	109	117	131.8
10	14.34	46	67.25	82	110	118	133.14
11	15.77	47	68.76	83	110.8	119	134.49
12	17.21	48	70.28	84	111.7	120	135.86
13	18.65	49	71.81	85	112.7	121	137.22
14	20.06	50	73.32	86	113.8	122	138.57
15	21.47	51	74.84	87	115	123	139.93
16	22.91	52	76.35	88	115.4	124	141.28
17	24.33	53	77.88	89	115.8	125	142.65
18	25.74	54	79.41	90	116.3	126	144
19	27.16	55	80.93	91	116.6		
20	28.59	56	82.46	92	117.1		
21	30.03	57	83.97	93	117.4		
22	31.45	58	85.48	94	117.9		
23	32.86	59	87	95	118.3		
24	34.29	60	87.8	96	118.6		
25	35.71	61	88.7	97	118.9		
26	37.15	62	89.6	98	119.3		
27	38.57	63	90.7	99	119.8		
28	40	64	91.9	100	120.1		
29	41.52	65	93	101	120.5		
30	43.03	66	93.9	102	120.8		
31	44.54	67	95	103	121.3		
32	46.06	68	95.9	104	121.6		
33	47.59	69	96.8	105	121.9		
34	49.1	70	97.6	106	122.3		
35	50.62	71	98.5	107	122.8		
36	52.13	72	99.6	108	123.2		


Dunamics of parameters
SQo
160
140
120
100
80
60
40
20
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
76
81
86
91
96
101
106
111
116
121
day
SQo

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