ISSN 2521 – 0408

AGRICULTURAL EXTENSION JOURNAL

Available Online at www.aextj.com
Agricultural Extension Journal 2019; 3(3):136-139

RESEARCH ARTICLE

Selection of Optimal Parameters of Impulse Sprinkling Systems of Self-oscillatory Action

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Received: 10-04-2019; Revised: 10-05-2019; Accepted: 10-07-2019

ABSTRACT

Introduction: Analysis of the results of approbation of impulse sprinkling systems of auto-booster action in mountain farming (Kuba-Khachmaz zone, in the Shahdag foothills, mountain Shirvan in the village of Malkham, Shamakhi region; the Karabakh zone in the Terter district in the village of Sarijali) in Azerbaijan indicates its great efficiency. **Result:** The data show that with the change of the average daily water changes to several major technical and economic indices. Hence, with a reduction in the average daily water supply reduces average diameter distribution network, specific material requirements, and consequently decreasing both capital and operating costs. **Result:** As a result of the analysis of the data possible to draw the following. **Conclusions:** For the conditions of Cuba-Khacmazsk zone should be considered optimal impulse sprinkling avtokolebatelnogo actions of the average watersupply 52.0 m^3/ha, which will ensure optimum diffusion hydrates soil when changes average evaporation from 10 to 60 m^3/ha.

Key words: Avtokolebatelnogo, self-oscillatory action, sprinkling systems

Analysis of the results of approbation of impulse sprinkling systems of auto-booster action in mountain farming (Kuba-Khachmaz zone, in the Shahdag foothills, mountain Shirvan in the village of Malkham, Shamakhi region; the Karabakh zone in the Terter district in the village of Sarijali) in Azerbaijan indicates its great efficiency. The main advantages of impulsive sprinkling of self-oscillating action is that, compared with conventional stationary sprinkling, material consumption, capital and operating costs, and electricity and water costs are reduced by 3–4 times, surface runoff and soil erosion are excluded.

Processing of long-term data showed that during the growing season, the average daily evaporation from meteorological stations of the regions with 95% accuracy does not exceed 38 m^3/ha, and only in isolated cases reach 60–70 m^3/ha, the moisture content of which varies within 0.25–0.45. At the same time, 24-h system operation is considered rational.

With optimal loading of the pump and pipeline network, the system provides water to the plants up to 104.5 m^3/ha day, which allows for daily water consumption for 3–4 h.

Artificial reduction of the average rain intensity due to an increase in the pause between shots on the digital intermediate-15 leads to idle operation of pumping units and an increase in electricity costs.

Periodic inclusion of the system into operation to ensure “round-the-clock mode” increases operating costs.[1-3]

Thus, almost double the stock performance, which not only increases the capital cost of the system but also has a negative impact on agricultural performance and managing also on regime water supply.

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Therefore, the determination of optimal parameters of systems based on the example of climatic conditions IDAD Cuba-Khacmaz zone would further increase the effectiveness of pulsed sprinkling, both in terms of improving its agricultural indicators and meet the best requirements of plants, agro-physiologically

Table 1: Dependency on technical and economic indices calculation various designs of impulse sprinkler

The name of the technoeconomic indicators	Dependencies	Note
1	2	3
Average network throughput		, $_{and}$=pipeline throughput and=order L_{and}=pipeline length=order
The weighted average of the diameter of the network	$(d)_{and} = (R_{RS.\ WA.})^{\alpha}$	α-flow coefficient α=0.446 for steel α=0.453 for asbestos cement α=0.442 for polyethylene
Hydraulic slope		For steel tubes For asbestos cement pipes For polyethylene pipes
1	**2**	**3**
Head loss		
Head loss in the network (based on local losses)		Module N – number of orders in the network of culverts
The required inlet pressure module	H_M=H + h_i	$U_{r=}$the required inlet pressure irrigation device (taken from the Repertoire of normative information on code irrigation device)
Material requirements	M_i=166.5 $d_i^{1.163}L_i$ $M_{(i)}$=L_i (3.04+6, 649d_i+349, 14 d_i^2) M_i=L_i (0.12, 89-1$_{i+}$125, 13 $(d)_{(i)}{}^2$) M_i=L_i (−0.015+0, 66 d $_{(i)}$)	For steel, d=0.05m For asbestos, If $(d)_{(i)}$ ^{3}0.2 $(d)_{(i)}$< 0.2 for polyethylene
The cost of the pipeline	With $_{(i)}$= 40, 8 $d^{1.31}L_i$ C_i=(0.22+1, 73d_i+31, 947d_i^2) L $_{(i)}$ C_i=(0.088-2,13d_i+154,83d_i^2) L $_{(i)}$ C_i=(0, 588$d_i^{1.607}$) L_i	For steel d – diameter, m L_i – length of pipeline For asbestos-cement When d>0.2 d<0.2 for polyethylene
1	**2**	**3**
Specific material requirements	M=	W=area of irrigated area (t/ha)
Unit capital investment	C=	
1	**2**	**3**
Pressurenodes	S_1=880+210QH S_2=760+180QH S_3=7450+365QH S_1= S_2= S_3=	For construction part For hydromechanical parts For electrical parts (QH=0.104×83=6.83) Formula cost S_1=S_1, S_2, S_3 in man S_2= S_3=
Network consumption	Q=q × w	Estimated ordinate of Hydro Mop products, m^3/s. ha w – irrigated area, ha
Energy costs	U_e=	U_e – in manats Q – quote consumption m^3/s N – head pumping station, m t – number of hours per year of pumping station w – irrigated area, ha
The number of hours of pumping station	t=	M – irrigation norm, m^3/ha
Operating costs	H=A + E+SN	And depreciation expenses, man E – on energy costs, man/ha RFP – wages, man
Given the cost	P_R=E_N×K + N	$(E)_n$ – coefficient of economic efficiency of capital investments for the new irrigation techniques, it is equal to -0.15 N – annual operating costs, man/ha

and technoeconomic parties at the expense of power pumping equipment, improve its mode of operation, reducing the intensity, and cost of pipeline network.[4,5,6]

To solve the task, the US considered three options with a daily system performance, 96, 48, and 34 m^3/ha for 10- and 100-hectare trimer pulsed sprinkling avtokolebatelnogo actions.

Baseline data processing is done on the computer using the technique and some standard indicators typing system of irrigation techniques developed by the VNIIM, etc., under the guidance of Nosenko V.F., etc.[6-8]

A technique designed to determine the optimal rotation for an irrigation system with water conduits of various modifications as one- and two-way connection.

When you define technique-economic indicators of various constructions, pulse sprinkling of dependencies that were used is summarized in Table 1.

As a criterion for the choice of an optimum variant was adopted the minimum value of a generally accepted indicator of the given cost.

Legality of use given as cost optimization criterion of water supply options most fully justified in the work of Prof. Galjamino EA.[7,8]

In Table 1 Provides technical and economic indicators on the three options considered design pulse-rain system activity avtokolebatelnogo the average water supply104 m^3/ha, 52 m^3/ha, and 34.7 m^3/ha for 10 and 100 hectare pulse modules sprinkling avtokolebatelnogo actions [Figure 1].

The data show that with the change of the average

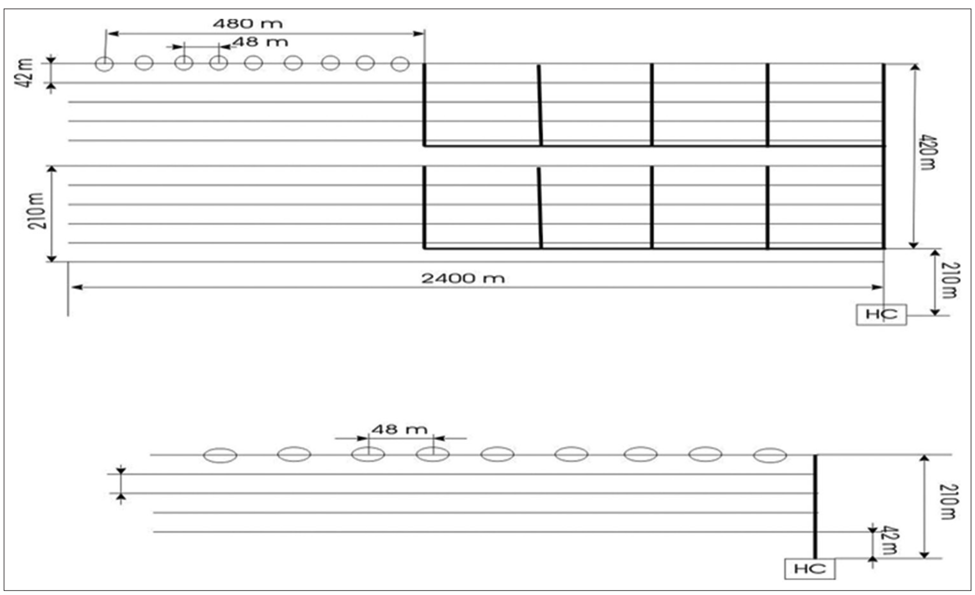

Figure 1: Network diagram pulse system actions on sites avtokolebatelnogo sprinkling of 100 hectares and 10 hectares

Table 2: Technical and economic indicators of various modifications of the design impulse sprinkling self-oscillating action

The name of the	Unit is	Section 10 ha			For plot 100 ha		
		Variant of impulse sprinkling m^3/ha					
1	2	3	4	5	6	7	8
The average network throughput	L/s	1.49	0.75	0.52	6.84	3.42	2.4
The average diameter of the network	Mm	52	38	32	79.8	58	50
Specific material requirements	t/ha	1.40	0.98	0.81	2.87	2.0	1.66
Capital investments, including total	T. man/ha	22,808	20,328	17,885	16,867.6	13,283.1	11,050.7
Irrigation network	«--»	3264.1	2240.6	1504.5	6574.9	4326.9	3029.9
Irrigation devices	«--»	7012.1	7012.1	7012.1	7012.1	7012.1	7012.1
Pressure forming nodes	«--»	12,239.6	11,366.9	10,176.9	1981.5	1553.7	1300.2
Operating costs	«--»	10,419.1	9456.9	8458.1	523.5	4615.8	4042.9
The costs	«--»	13840.2	12510.5	11141.3	8051.6	6079	5699.9

With the increase in irrigated area decreases the cost of pressure forming site daily water changes to several major technical and economic indices. Hence, with a reduction in the average daily water supply reduces average diameter distribution network, specific material requirements, and consequently decreasing both capital and operating costs.

The first reduced by lowering the cost of pressure forming site and distribution network, and the latter by reducing the costs of depreciation and electricity. As a consequence, reduced the costs quoted.

As a result of the analysis of the data possible to draw the following conclusions:

For the conditions of Cuba-Khacmazsk zone should be considered optimal impulse sprinkling avtokolebatelnogo actions of the average water supply 52.0 m^3/ha, which will ensure optimum diffusion hydrates soil when changes average evaporation from 10 to 60 m^3/ha. The correctness of this conclusion is confirmed by the rate reduction contained costs. The second option in comparison with the first they have decreased substantially. You should consider when designing systems featuring pulse-integrated sprinkling avtokolebatelnogo actions perform the optimization calculations whose task would be to define technical and economic indices of SIDAD that is best for the specific nature of economic conditions.

- This is why the proposed supply industry pulse sets only a sprinkling of self-oscillating avtokolebatelnogo without pumping stations and generators of command impulses, etc., accompanying elements be considered correct [Table 2].
- Reduction of the average water supply and approximation with the average daily – Martin will not only reduce all types of expenses but also to ensure that the recommended 24-h water supply mode and really increase productivity of agricultural crops.
- Should be considered as a rational work two sets of SIDAD with one full-time pump having reserve the second pump in case of accident. Such a future mass-produced SIDAD will not only reduce energy intensity but also improve the reliability of the system as a whole.

REFERENCES

1. Aliyev ZH. Scientific Rationale for the Development and Implementation of Automated Low-intensity Irrigation in Azerbaijan. Azerbaijan: Baku Publisher; 2006. p. 144-9.
2. Aliyev ZH. The rationale for the Use of Rational Irrigation Equipment and Technology in the Regions of Mountain Farming in Azerbaijan. Cb Works BSU. Baku: Geographical Society; 2006. p. 165-74.
3. Aliyev ZH. Study of the Parameters and Reliability of a Low-intensity Irrigation System for a Slave in the Conditions of Mountain Farming in Azerbaijan. Proceedings. Nah.GU. Nakhichevan; 2007. p. 73-81.
4. Laktaev NG, Zvonkova TV. Classification of Relief on Sloping Lands of Central Asia. Moscow: Kolos; 1989.
5. Lebedev GV. Irrigation, Microclimate, Water Regime and Plant Productivity. Moscow: Nauka; 1986. p. 89.
6. Nosenko VF. Irrigation Technique Requirements and Objectives for Improvement. Kolomna: Collection of scientific works of VNIIMI; 1974. p. 213.
7. Nurmatov N, Golumdzhanov AG. Improvement Techniques in Furrow Irrigation on Sloping Lands. (Irrigation in Mountain Conditions). Moscow: Publishing House Kolos; 1991. p. 88-93.
8. Nosenko VF. The Principles of the Land Irrigation Technique. Kolomna: VNIIMI; 1974. p. 193.