

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

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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 it's definitely 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, electricity and water costs are reduced by 3-4 times, surface runoff and soil erosion are excluded [2,3].

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 $38 \text{ m}^3/\text{ha}$, and only in isolated cases reaches $60\text{-}70 \text{ m}^3/\text{ha}$, the moisture content of which varies within 0.25 0.45. At the same time, the 24-hour system operation is considered rational.

With optimal loading of the pump and pipeline network, the system provides water to the plants up to $104.5 \text{ m}^3/\text{ha}$ day, which allows for daily water consumption for 3-4 hours.

Artificial reduction of the average rain intensity due to an increase in the pause between shots on the DI-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 the also on regime water supply.

Therefore, the determination of optimal parameters of systems based on the example of climatic conditions IDAD Cuba-Khachmaz 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 and techno-economic parties at the expense of power pumping equipment, improve its mode of operation, reducing the intensity and cost of pipeline network.

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

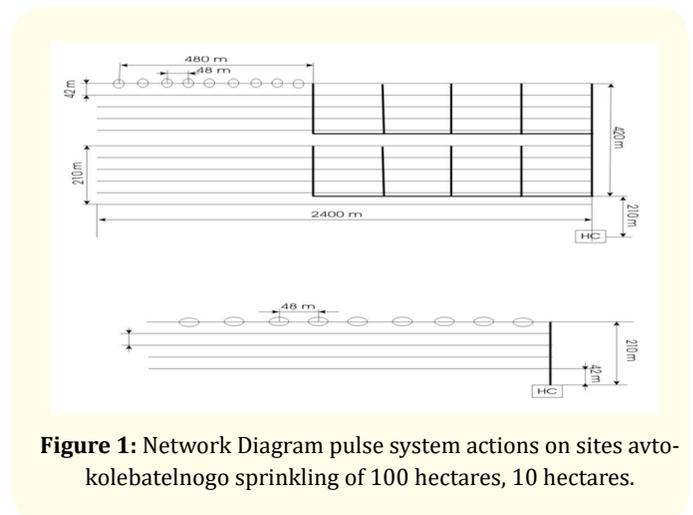


Figure 1: Network Diagram pulse system actions on sites avtokolebatelnogo sprinkling of 100 hectares, 10 hectares.

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 a technique-economic indicators of various constructions pulse sprinkling of dependencies that were used are summarized in the table 1.

The name of the techno-economic indicators	Dependencies	Note
1	2	3
Average network throughput		α_{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 $\alpha = 0.446$ for steel $\alpha = 0.453$ for asbestos cement $\alpha = 0.442$ 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 $d = 0.05$ m For asbestos If $(d)_{(i)} > 0.2$ $(d)_{(i)} < 0.2$ for polyethylene
The cost of the pipeline	With $(i) = 40, 8 d^{1.31} L_i$ $C_i = (0.22 + 1, 73d_i + 31, 947d_i^2) L_{(i)}$ $C_i = (0.088 - 2, 13d_i + 154, 83d_i^2) L_{(i)}$ $C_i = (0, 588d_i^{1.607}) L_i$	-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
Pressure nodes	$S_1 = 880 + 210QH$ $S_2 = 760 + 180QH$ $S_3 = 7450 + 365QH$ $S_1 =$ $S_2 =$ $S_3 =$	-for construction part -for hydro mechanical parts -for electrical parts ($QH = 0.104 \times 83 = 6.83$) formula cost $S_1 = S_1, S_2, S_3$ in man. $S_2 =$ $S_3 =$
Network consumption	$Q = q \times w$	Estimated ordinate of hydromop 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	$P_R = E_N \times K + N$	(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

Table 1

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

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 [6,8].

In table 1.1. Provides technical and economic indicators on the three options considered design pulse-rain system activity avtokolebatelnogo the average water supply 104 m³/ha, 52 m³/ha, and 34.7 m³/ha for 10 and 100 hectare pulse modules sprinkling avtokolebatelnogo actions.

The data shows that with the change of the average daily water changes to several major technical and economic indices. So, with a reduction in the average daily water supply reduces average diameter distribution network, specific material requirements, consequently decreasing both capital and operating costs.

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

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 m³/ha, which will ensure optimum diffusion hydrates soil when changes average evaporation from 10 to 60 m³/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 is best for the specific nature of economic conditions.

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
1. The average network throughput	L/s	1.49	0.75	0.52	6.84	3.42	2.4
2. The average diameter of the network	Mm	52	38	32	79.8	58	50
3. Specific material requirements	t/ha	1.40	0.98	0.81	2.87	2.0	1.66
4. Capital investments, including total:	T. man/ha	22808	20328	17885	16867.6	13283.1	11050.7
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	«--»	12239.6	11366.9	10176.9	1981.5	1553.7	1300.2
5. Operating costs	«--»	10419.1	9456.9	8458.1	523.5	4615.8	4042.9
6. the costs	«--»	13840.2	12510.5	11141.3	8051.6	6079	5699.9

Table 2

Note: With the increase in irrigated area decreases the cost of pressure forming site.

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;

- 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-hour 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.

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