

Bringing to a Stop Madness in Spraying of Pesticides*

After becoming acquainted with spraying using slotted nozzles, my heart sank. In front of me appeared my mother, who in difficult post-war years, cursing a beetle from the state of Colorado, tied a rag to protect my bare feet and with tears in her eyes sent me off to spray potatoes. “Take a broom from the closet. Choose one with fine ends- you will use less trichlorfon. With not enough trichlorfon, the beetle will destroy the potatoes, and then what will we eat?” This not at all rhetorical question remained in my memory for life.

Many years have passed since that time. A man has circled the earth, entered outer space, learned the secrets of DNA, but in spraying still rules the same broom in the form of a slotted nozzle, which creates a strip from drops in much the same way as a broom, but unfortunately not the one with fine ends.

The first impression of what I saw: and what does this have to do with spraying? This is an ordinary overhead irrigation of plants and soil.

Jet nozzles, which include slotted nozzles, from an expert's point of view, are unsuitable for spraying. Due to the high speed, drops on contact with a plant splatter and slide off on the soil. Permissible speed is at which kinetic energy of the drop is less than surface energy. Only under this condition, the drop is deposited on a plant. The fraction of deposited drops is what determines the effectiveness of spraying. Experts D. and F. Gassen have determined that during spraying with slot nozzles, 5 % of pesticide reaches plants. According to the measured data for velocity and dispersion of droplets, such as of the injector nozzle, the fraction of volume of droplets which are deposited on the plant does not exceed 8 %. A powerful industry spraying pesticides using slotted nozzles is contributing to the increasing levels of soil pollution.

In the product catalogue of Spraying Systems (USA) the slotted nozzle is offered as “Don't Last Forever,” though without specifying a lifespan. However, this lifespan is too short due to the wear of the slot's edges. At the same time there's an increase in the flow rate of the working fluid and drop size. After only 50-70 hours of operation, flow rate increases by 10% and such an increase, as is shown in the catalogue, results in losses of \$300 per hectare. Therefore slotted nozzles require overseeing with the replacement of the worn ones by the new. To fulfill this requirement, a field is transformed into a laboratory for research and study of the slotted nozzle wear. Dozens of plants in the world work on resupplying such “goods.”

Slotted nozzles are unreliable. Due to the small width of the slot, in order to prevent clogging individual filters are installed in front of the atomizers with a cell size of the mesh three times smaller than the slot. Filters also become clogged, and so it's recommended that they are cleaned daily. Filter clogging leads to an uncontrollable decrease of flow rate. Cleaning the filter and the slot is hazardous for the service personnel since it is tied to the direct contact between the person and pesticide.

Phenomenon of madness, worthy of being entered into the Guinness Book of Records, is the use of the inefficient, short-lived, unreliable and dangerous to service slotted nozzles for spraying over 50 years on all continents. A high price is paid by humanity for their madness.

When posing the logical question, “Is there an alternative to the slotted nozzle?”; the answer is affirmative- an alternative exists!

At the suggestion of director of the regional state enterprise «Днепроагрохим» (Dneproagrohim) Lemishka N.V.: “To make an atomizer that ends peoples’ torment,” at the turn of the millennia in Ukraine was created an efficient, long-lasting, reliable and safe to use centrifugal atomizer ROsá®. In 1997 this atomizer passed laboratory tests in the Institute of Maize and on sprayers of Vasil’kovskiy’s «Райагрохим» (Raiagrohim). Ten thousand atomizers were manufactured by the Dnepropetrovsk machine-building plant for the large-scale field trials.

Owing to the persistence of Melezhik A.I., atomizers ROsá® work practically on all types of sprayers produced domestically and abroad in Ukraine, near and far abroad. Most of the farms in Dnepropetrovsk work only with atomizers ROsá®. He was awarded the degree of Doctor of Science for improving the dispersion in pesticide atomization.

Atomizers ROsá® are created on the basis of new ideas and advances in hydrodynamic swirling flows. Centrifugal atomization provides a qualitatively new level of spraying by reducing drops by nearly a half in comparison to slotted nozzles and forced settling of the drops by air which is suctioned by the jet. The volume fraction of drops settled on plants at a flow rate of 47 L/ha reaches 80-85%, ensuring coverage of over 200 drops/cm², whereas the recommended number for herbicides is 30-40 drops/cm², insecticides—30, fungicides—50-70. Quantity of the drops settled by the atomizer ROsá® allows for a reduction of flow rate to 20 L/ha.

The use of pesticide with concentration in the working fluid recommended by the pesticide manufacturer, such as 2 L to 300 L of water per hectare, should remain the same for atomizers ROsá®. Under such condition, consumption of pesticide per hectare decreases by 6 times. Further reduction in consumption requires additional research, but the prerequisites for a transition to such consumption rate have been created.

“To end peoples’ torment” an atomizer must be durable, reliable and safe in service, able to settle the recommended amount of drops during spraying under conditions of wind, low humidity and high temperature.

Properties of the atomizer (flow rate, spray angle and dispersion of drops) must not change for the entire course of sprayer’s use. This is possible in the absence of deterioration of the atomizer’s flow path due to corrosion, erosion, and cavitation. Protection of surfaces against wear, on which depend hydraulic properties, guarantees a service life of over 7000 hours for the atomizer ROsá®, which is sufficient for spraying in the course of 5

years. This service life is confirmed by the use of sprayers, manufactured domestically and abroad, since 1999.

Reliability of the atomizer ROsá® is ensured by the large (as compared with the slotted nozzle) sizes of canals and the construction arrangement of a flow path which provides protection from the ingress of mechanical impurities from the fluid into the canals, as well as absence of individual filters. Water filtration when filling the tank and before the pump through cells of 0.3 mm is sufficient.

Atomizer ROsá® requires neither cleaning nor control of flow rate, thus achieving safe service. The only remaining maintenance method is visual inspection of integrity of the jets from the operator's compartment.

The main characteristic of the sprayer—number of drops deposited per unit area as determined during state trials, depends on wind velocity, humidity and air temperature. Atomizer ROsá® allows you to work at a wind speed of up to 9 m/s, air humidity- up to 30% and temperature of up to 30°C. Under these conditions, the slotted nozzle's losses exceed 50% of the atomized fluid and spraying is prohibited. For the atomizer ROsá® in conditions of less wind, higher humidity and lower temperatures, use of correction to reduce the flow rate of the working fluid per hectare is necessary.

How to end the madness in spraying of pesticides?

1. On farms, slotted nozzles should be put in the rag and thrown in a landfill.
2. Order a set of atomizers ROsá® for each sprayer, based on the flow rate of 50 L/ha.
3. Pesticides should be applied with adherence to the concentration in the working fluid specified by the manufacturer.

The phenomenon of madness became possible because the level of atomization technology of the firms manufacturing slotted nozzles, which see themselves as leaders, corresponds to the period of human development, when it was believed that the Earth is flat and floats on three pillars. Unfortunately, technological policy in spraying is determined by the sales managers; moreover, the manufacturers of pesticides and slotted nozzles are interested in increasing sales volume.

Atomizer ROsá® — is the future in spraying of pesticides. Take the opportunity to reduce the consumption of pesticides and soil pollution!

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City of Dnepropetrovsk

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