The precise dependence of the decrease in the indicator values characterizing the reproduction of amphibians in the conditions of melioration can't be revealed, since this process in general depends on many other factors such as temperature, humidity, pressure, water acidity, aluminum ions content, etc. However, the research on the amphibian spawning has made it clear that melioration channels have poor efficiency as the spawning grounds for amphibians. In the drainage melioration zone many indicators of the spawning change towards a decrease.

ANALYSIS OF INFLUENCE AND CONSEQUENCES OF ACCIDENTS AT CHERNOBYL AND FUKUSHIMA

L. Astrouskaya, N. Bushkevich, N. Gerasimovich, I. Puhteeva

Belarusian State University, ISEI BSU,
Minsk, Republic of Belarus
nvgerasimovich@mail.ru

The Chernobyl and Fukushima nuclear power plant accidents are considered to have the most drastic environmental impacts, which caused serious damage to the different aspects of the affected countries and the world development in general.

The composition of radioactive releases was different though. The accident at the Chernobyl NPS was accompanied by the release of irradiated nuclear fuel solid particles and fission products ("hot" particles) with a different isotopic composition. The accident at the Fukushima NPS was accompanied largely by the release of volatile isotopes, in particular, the isotopes of iodine and cesium. The effect of β- and α-radiation on the radiation situation was not so strong compared to the accident at Chernobyl.

Keywords: Chernobyl, Fukushima, isotopic composition, iodine, cesium, β-radiation, α-radiation

During the lifetime of one generation there were 4 major radiation accidents with a contamination area in different countries: at the atomic plant "Mayak", USSR, 1957; at the Three Mile Island nuclear power station (NPS), USA, 1979; at the Chernobyl NPS, USSR, 1986; at the Fukushima NPS, Japan, 2011.

The nuclear accidents in Chernobyl and Fukushima are considered to have the most drastic environmental impacts, which caused serious damage to the different aspects of the affected countries and the world development in general.

The 2011 nuclear accident at Fukushima Daiichi and the 1986 accident at Chernobyl were both rated 7 on the International Nuclear and Radiological Event Scale, but the accidents were starkly different in their cause, the governments' response and health effects.

The accident at Chernobyl stemmed from a flawed reactor design and a human error. It released about 10 times the radiation that was released after the Fukushima accident. The accident at Fukushima occurred after a series of tsunami waves struck the plant and disabled the systems needed to cool the nuclear fuel.

The composition of radioactive releases was different as well. The accident at the Chernobyl NPS was accompanied by the release of irradiated nuclear fuel solid particles and fission products ("hot" particles) with a different isotopic composition. The accident at the Fukushima NPS was accompanied largely by the release of volatile isotopes, in particular, the isotopes of iodine and cesium (Chernikov, 2011). The effect of β- and α-radiation on the radiation situation was not so strong compared to the accident at Chernobyl.

The consequences of the accidents at Chernobyl and Fukushima can be compared based on the following indices:

1. The release of radioactive substances into the atmosphere: 340–800 PBq (Fukushima) 5200 PBq (Chernobyl);

2. The contamination of the territories of their countries: 8000 km^2 (Fukushima) and 450000 km^2 (Chernobyl);

3. The contamination of the territory of other countries. The accident at the Fukushima NPS did not cause pollution in other countries, while 250000 km^2 in Western Europe were polluted after the Chernobyl accident.

4. The area of evacuation: 10800 km^2 (Chernobyl) and 1100 km^2 (Fukushima). The evacuation of the population: 400000 people (Chernobyl) and 83000 (Fukushima).

5. The loss of lives from the acute radiation disease within 4 months after the accident: 28 (Chernobyl) and 0 (Fukushima).

The above comparison shows that the scale of the accident at the Chernobyl NPS is about 10 times greater than the scale of the accident at the Fukushima NPS. The accident at the Chernobyl NPS was an international disaster with pollution in other countries. The pollution at the Fukushima NPS accident is limited to the areas within Japan. The release of radioactive substances and radiation situation in the polluted areas within 30 km zone of

Chernobyl NPS caused grave consequences for the health of the liquidators. The results of the exposure to β-radiation were “nuclear sunburn” e-skin blackening of faces and hands of the first liquidators, and nuclear quinsy e-continuous hoarse cough due to throat and bronchia burn.

STRUCTURE OF SOFTWA RE AND HARDWARE COMPLEX FOR MONITORING AND CONTROL OF PARAMETERS AND MODES OF SOLAR COLLECTORS

M. Avizhets[1], B. Tonkonogov[2]

[1]Minsk city executive committee
Minsk, Belarus
[1]Belarusian State University, ISEI BSU,
Minsk, Republic of Belarus
boristonkonogov@iseu.by

Some characteristics and features of structure of software and hardware complex for monitoring and control of parameters and modes of solar collectors are considered, that will allow realizing remote automated operation with this equipment that is difficult to maintain, as well as located in hard-to-reach places, and make prerequisites for rather effective and optimal solutions of its using.

Keywords: structure, software and hardware complex, monitoring and control, solar collectors.

Currently, due to the large demand of the automated management of various devices and the measurement of various media parameters, there have been proliferated different software and hardware complexes for monitoring and control of large amount of parameters and modes and special embedded systems – microprocessor (microcontroller) hardware and software management systems that are intended, as a rule, for functioning in the devices that are controlled directly by them. Such devices can be applied to automated or automatic adjustment and manufacturing control equipment, telecommunications equipment, machines with computer numerical control, automated teller machines, payment terminals, etc. It is also advisable to use similar systems in the field of renewable energy in order to optimize the operating modes of the corresponding equipment.

One of the software development platforms for such systems are Microsoft .NET Micro Framework or Arduino. They allow in environments Microsoft Visual Studio or Arduino IDE using the C# or C++ programming language to create applications for different embedded devices, which are characterized by the minimum weight, size and power consumption as they are placed within more complex equipment. These platforms are rather popular because the code (managed for C# language) is created using a high-level language and it simplifies the process and reduces the time of software development for hardware platforms. In this, during stand-alone functioning of the debugging board it is not required to use a computer with an operating system and development environment later.

Some of the application areas of mentioned above systems in the environmental problems:

- collecting and processing of data from sensors located in different equipment, for example, such as used in the renewable energy sector;
- remote monitoring and control of equipment parameters of the industrial and infrastructure facilities;
- building of geographically distributed systems of data collection and processing for monitoring of environmental parameters, and the like.

To test the effectiveness of using microcontroller embedded systems for solving environmental problems it is planned to develop an automated system for monitoring and control the status and operation of solar collectors. Key features of this system and its developed functional structure:

- data collection for the building of various dependencies of temperature and its differences from time in specific places of equipment;
- calculation of energy performance for a predetermined periods and formation of data for charting characterizing energy efficiency of equipment;
- monitoring of the current values of equipment’s parameters;
- control of different equipment’s operating modes.

In solving of presented problems for software implementation, deployment and debugging of software directly on the physical device can be used the following:

- debugging board with the microcontroller of ARM Cortex M or AVR architecture;
- sensors, actuating devices and shields (expansion cards);
- computer to which the debugging board is connected;
- installed integrated development environment and software framework and development tools (kit).