Application of the proposed fuzzy model of occupational risks assessment for the health of employees at oil refinery plant could facilitate taking adequate administrative decisions on elimination or limitation of the negative impact of production factors under uncertainty and, as a result, improve the quality of the occupational health and safety management system.

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APPLICATION OF TECHNOLOGY OF LASER SINTERING OF METAL POWDER

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One of perspective directions of creation of automated production is using technology of direct metal laser sintering (DMLS). The essence of this technology is paired computer-aided design (CAD) with auto manufacturing parts using special devices – 3D printers.

In view of the development of scientific and technical progress, we have an actual problem of complex automatic and robotic equipment. Moreover, due to the massive creation of flexible production it is necessary to develop mobile, single and small-scale manufacturing units. A feature of these developments is that most of the issues involved in creating technological complexes fall in the conjugation technologies, such as mechanics and electronics, electronics and IT. That is why most discoveries nowadays raise issues of interfacing technologies. This technology covers metallurgy, electronics, optics, quantum physics and IT.

Laser sintering of metal is a kind of additive synthesis technology.

Direct metal laser sintering (**DMLS**) is an additive manufacturing technique used for the low volume production of prototype models and functional components (fig.1) [1].

The technology has many benefits over traditional manufacturing techniques. The ability to produce quickly a unique part is the most obvious advantage because no special tooling is required and parts can be built in a matter of hours. Additionally, DMLS allows for more rigorous testing of prototypes. Since DMLS can use most alloys, prototypes can now be functional hardware made out of the same material as production components [2].

So, the benefits are:

- a significant increase in production flexibility;
- an excellent mechanical properties of items;
- improving the competitiveness of production;
- reduction of production costs, especially for a small-scale production;
- greatly reduces computer numerical control (CNC) & electrical discharge machining (EDM) costs;
- reduction the time to market new products;
- the integration of computer technology and CAD systems [3].

The main problem is the hardware to ensure accuracy in the manufactured products. Key issues to ensure accuracy are the following:

- preparation of metal powder for sintering;
- selection of lasing mode;
- ensuring of the positioning of the reflecting mirror;
- focusing of laser beam.

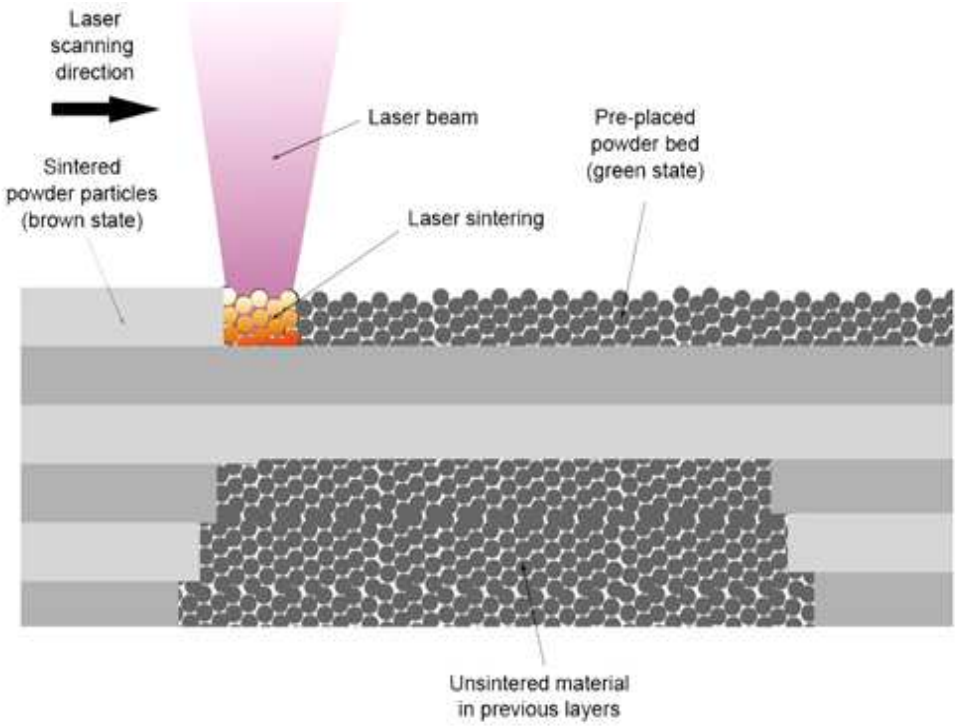

Fig. 1. Process of laser sintering

Before laser sintering (scanning) a powder mixture is aligned by a special roller (fig. 2). One of the most difficult problems of the sintering process of metal soot is heat transfer in porous environment, i.e. investigation of thermal fields arising in the powder layer with pulsed laser treatment.

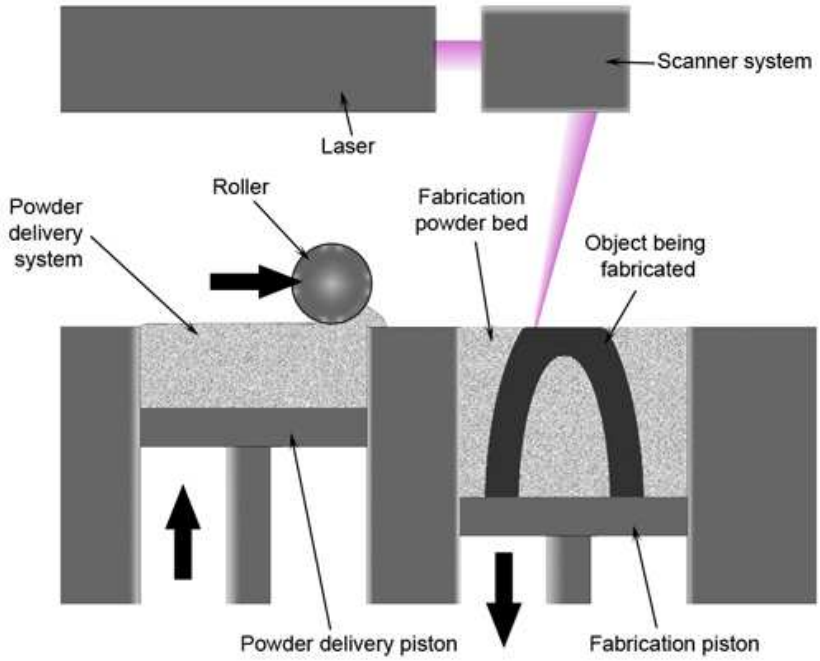

Fig. 2. Process of laser sintering

In laser 3D-printers an executive body uses solid-state lasers. As the active body used a rod of ruby or glass doped with neodymium or YAG doped with neodymium or ytterbium. It is located in the lighting chamber. To excite the atoms of the active body a lamp pump is used. The lamp pump creates a powerful flash of light.

Power of laser is chosen according to the boiling point of the powder, the thermal diffusivity, the shape and the average particle size to prevent burning of the sample. It is extremely difficult to pick out empirically the optimum value of power. The need to achieve a state in which the liquid phase in the powder layer is about 15% does not allow preventing the melt to be overheated, leading to the formation of a fluidized layer.

There are servo motors as components of precise equipment in printer. The basis of a sensor system consists of different contact and contactless sensors.

3D-printers software is divided into three categories (fig.3):

1) Computer-aided design. In a few minutes, you can create three-dimensional physical body and even assembly units of any complexity.
2) Drivers and utility programs that convert files with 3D-object in a machine understandable byte code.
3) SCADA-systems are used for industrial purposes in lasting production processes.

Fig. 3. Stages of manufacture: from modeling to fabrication of a physical body

This technology is used to manufacture direct parts for a variety of industries including aerospace, dental, medical and other industries that have small medium size, highly complex parts and the tooling industry to make direct tooling insert.

With this technology, you can make parts of any complexity.

Technology of DMLS allows to prepare implantsprosthetics and guides for surgery (fig. 4) [4].

Fig. 4. Printed jowl implant

No less interesting direction of DMLS is micromachining (fig. 5) [5].

Fig. 5. Elements of micromachining.

The process of creating of 3D-models has ceased to be difficult and time-consuming. Furthermore, now it is more economical and allows increasing significantly the flexibility of production. Moreover, it reduces the number of technological processes in production.

The use of this technology is especially important in mobile and rapidly developing IT-industries because the equipment for such production can be easily transported and operated. This technology allows producing an original product – machine parts or components of a piece of equipment – in any conditions.

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APPLICATION OF POLYACRYLAMIDE IN MODERN WORLD

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This article is about the industrial application of such a perspective material as polyacrylamide.

Currently ecology becomes a strategic industry, affecting on all spheres of political and economic prosperity of the state . Natural resources, quality of life, health and life span and even future of the country – all of them depend on the ecological situation of the environment.

Protection of the environment from pollution is one of the major problem of modern society. Environmental pollution can be primarily seen in the quality of surface and groundwater that is used in water supply. The organoleptic and chemical properties of water deteriorate from the inflow of wastewater, stormwater and meltwater [1].

This happens due to the change in the structure of industry, physical and moral deterioration of sewage treatment plants, absence or lack of funds from enterprises, the weakening of control over their water protection activities.

In this regard, in the 21st century the main strategic direction of reconstruction of water supply for industrial enterprises is the creation of closed water systems, which is impossible without alteration and improvement of existing treatment facilities and introduction of advanced technologies and equipment. New perspective methods of wastewater treatment are flocculation, sorption, membrane and oxidative methods [2].

Among the effective ways of intensifying existing technologies of natural and waste waters purification is the use of high-molecular flocculants alone or together with inorganic coagulants. Only due to the widespread introduction of physico-chemical treatment of industrial wastewater using coagulants and flocculants can provide effective 97-98 % removal of colloidal and finely impurities such as oil, grease, dyes, surfactants, etc.