JAW TYPES DESIGN AT THE INTELLIGENT MANUFACTURING-ASSEMBLY CELL

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ABSTRACT: In this contribution is presented a jaw types design at the intelligent manufacturing cell. This manufacturing cell is situated at the Institute of Production System and Applied Mechanics. The complex jaw types design is going out intelligent manufacturing systems knowledge's. Automated exchange system was designed with types of jaws in the intelligent manufacturing cell and after was designed the sensory system for gripper buffers. These sensors are used for identification of jaws.

KEYWORDS: system, design, mechanics, manufacturing, jaw, types

INTRODUCTION

The industrial manufacture is still forwarding. Today we are not talking only about using of IT, classical automated instruments. But when we are talking about flexible manufacturing systems it is effective to talk also about possible using of new generation manufacturing systems. These new generation manufacturing systems are also called intelligent manufacturing systems (IMS). All IMS subsystems are including parts of so called machine intelligence (sensor equipment).

CHARACTERISTICS OF FLEXIBLE MANUFACTURING AND ASSEMBLY CELL

At the Institute of Production System and Applied Mechanics is situated flexible manufacturing cell. During the design of intelligent manufacturing cell, there was very important to conserve two basic subsystems, such as was during flexible manufacturing cell design. For presence analysis of gripper at the buffer are used inductive sensors. For identification of single gripper types following to their shapes, was designed identification system, which is using colour sensing sensors.

EXCHANGE SYSTEM OF GRIPPER IN BUFFERS

At this intelligent cell are situated eight of grippers jaw types. By this exchange are used grippers of types MHZ2. Blanks, parts, tools, fixtures can to be of handling subjects. These elements are as working objects. Elements of handling are physical entity of different forms, from different materials with different complexity. These elements have exact parameters as dimensions, weight, and centre. On the fig.1 is to see different types and forms of parts. Different jaws of grippers will to handle with these parts at the intelligent manufacturing-assembly cell.

Design shape of gripper active element is the first step by the design of jaws shapes. Gripper active element design is made through graphic methods, which accept shapes, dimensions of handling element, necessary kinematics of jaws movement by the grip. These methods must accept touch points at the active parts of gripper’s jaws. Main parameters for selection of grip method at the intelligent manufacturing cell:

- object characteristic of handling: shape, dimensions, weight,
- object attribute: stiffness, shape, surface condition,
- places for grip: shape, centre distance, attribute of main places,
- handling requirements.

Shape design of gripper elements is dependent on shape, blanks dimensions and parts and cooperation with devices. Gripper jaws will be designed in two basic effectuates and will to handle with selected type and blanks form and parts.

Fig.1: Different types and shapes of parts
**Described Basic Effectuates of Gripper Jaws**

Rotary blanks - Gripper jaws will shape of V-block,

Advantages of prismatic grip:
- reliable grip,
- centering,
- grip of rotary blank and at gripper jaws,

Jaws V-block is designed in different sizes for different diameters of blanks. These different sizes ensure reliable grip for blanks and parts of diameters.

**Size Calculation Jaws V-Blocks**

For diameters from $D=5\text{mm}$ to $D=80\text{mm}$ for angle $90^\circ$,

Jaws V-blocks have different grip angle from $45^\circ$ to $120^\circ$.

Calculation procedure of jaws V-blocks:
1. Calculation of V-block width V-block width is calculated for maximal and minimal diameter of fixed rotary blank.

On the fig.2 is V-block main dimensions.

Calculation of V-blocks width for minimal diameter $D_{\text{min}}=5\text{mm}$ fig.3.

**Calculation of fixed blank maximal diameter,**
which is fixed in the V-block with $7,07\text{mm}$

Calculation is on the “fig.4”.

Maximal diameter of blank is $9,99\text{mm}$.

This blank is possible to fix in the V-block.

On the fig.5 are V-block dimensions and diameter of blank.

Non-rotating blanks - Gripper jaws will be designed as flat and shaped jaws.

On the “Fig.6” is possible to see designed shapes of gripper jaws.

**Grip Alternatives through Described Gripper Jaws**

1. **Long part of rotary shape:** Screw

On this grip of long rotary part - screw “Fig.7”. Contact piece of jaws with screw is designed for exact diameter of screw.

This design is appropriate for insertion of screw in holes by assembly.

Main requirements for this grip are:
- distance of part,
- throw of manipulator at the intelligent manufacturing assembly cell in axis-Z,

2. **Grip of spherical blank**

Designed jaws ensure grip and centering of blanks “Fig.8”.

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**Fig.2:** V-block main dimensions

**Fig.3:** V-block width for blank with minimal diameter

**Fig.4:** Calculation of maximal diameter

**Fig.5:** V-block dimensions and diameter of blank.

**Fig.6:** Designed shapes of gripper jaws

**Fig.7:** Grip of long rotary part - screw

**Fig.8:** Grip for spherical blank
CONCLUSIONS

During the design process of intelligent manufacturing cell, and during the design process of automated tool changing system, jaws types design a sequential diagram methodology was used. In the intelligent manufacturing-assembly cell are situated some shape of gripper with different shapes of jaws for blanks handling or tools handling.

Gripper with jaws is situated at the workplace intelligent manufacturing cell in buffers. Buffers fixed at the work panel through screw.

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REFERENCES