

Multi slot groove cutting machine

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ABSTRACT

The designed machine is going to use for the mass production of rack gear slotting operation. It consists of a magnetic chuck instead of conventional milling machine bed. By magnetic chuck the number of w/p can be fixed at time is 4 as our dimension of magnetic chuck but it can be modified according to need of the customer requirement. The measurement of angles also can be done on the magnetic chuck as this machine is consists of an angle protector as the worker doesn't need to change it every time. Once the plates are placed at a desired angle that doesn't need to change its position again and again.

Keywords: Milling machine, Arbor, magnetic bed, servo motor, and hydraulic power pack.

I. INTRODUCTION

Mass production, also known as flow production or continuous production, is the production of large amounts of standardized products, including and especially on assembly lines. Together with job production and batch production, it is one of the three main production methods.

Mass production is a system of manufacturing based on principles such as the use of interchangeable parts, large-scale production, and the high-volume assembly line. As a result, mass production quickly became the dominant form of manufacturing around the world, also exerting a profound impact on popular culture.

Before the advent of mass production, goods were usually manufactured on a made to order basis. Once mass production was developed and perfected, consumer goods could be made for the broadest possible market. Anything consumers needed or desired could be made in larger quantities. Mass production resulted in lower prices of consumer goods. Eventually, the economies of scale result in the most affordable price of any product for the consumer without the manufacturer having to sacrifice profits.

MSGC- Multi slot groove cutting was a one of the mass production machine it is nothing but one type of modified milling machine. Generally MSGC designed based on the slot generating in different angle and make slot on more than one object at a one pass

II. METHODS AND MATERIAL RETROFIT

In present condition of technical industry all is demand for high quality product at short time with accuracy. Now the day all industries are adopt Modern technology for mass production and also they bare start to develop automates machine in their industry.

1: to furnish (something, such as a computer, airplane, or building) with new or modified parts or equipment not available or considered necessary at the time of manufacture

2: to install (new or modified parts or equipment) in something previously manufactured or constructed

3: to adapt to a new purpose or need



Fig. retrofit concept

- A new control system is the cost-effective alternative to purchasing a new cutting machine.
- Short retrofitting time of just around 2 days. Our control system is supplied fully pre-tested.
- All servomotors are supplied with prefabricated adapter plates. The old motor is simply replaced with the new one. There is no need to make any adaptations on-site, which significantly reduces the conversion time.
- User-friendly control system interface with a very short familiarization phase. After just a few hours, the user is able to work independently with the new control system. This means no laborious, time-consuming training is required.
- An optionally integrated modem enables remote diagnoses and software updates worldwide. This drastically reduces service costs.

There are many pre activities done before selecting the MSGC. Below activities are done for MSGC.

1. Industry observation
2. Canvas preparation
3. Basic parameter and machine study
4. Possibility to implementation

Possible change

In MSGC we replaced some element in horizontal milling machine to increased productivity and proper working.

	Actual part	Replaced part for MSGC
w/p table motion	Ball screw	Hydraulic power pack
w/p motion	Linear	Linear + rotary
Cutting tool holder	Normal milling arbor	Multi tool arbor
Control/ input	Manual or semi automates	PLC and totally automates

MSGC specification

Machine Concept

“To assemble the hydraulic power pack, magnetic chuck and PLC system in horizontal milling machine to reduce the human error and work cycle time.”

It is nothing but one type of modified milling machine. In present condition of different industry all are demand for good quality and large quantity output with highly accuracy. To fulfil this demand required new things.

MSGC include some modern technology and modern feedback system to improve the quality of work piece. The principle of MSGC is shown in fig3.1. It consists of below basic elements

- Input devices
Key board
Computer data base

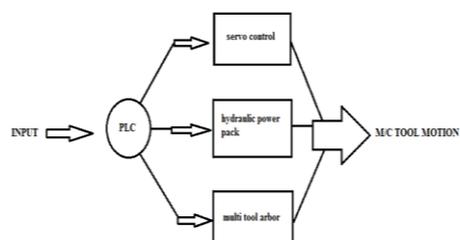


Figure: concept of MSGC

Here some standard specification are shown as per concept

WORKING PRESSURE	2500PSI TO 3000PSI
WORKING TEMP	-20°C ~ 120°C
BORE SIZE	2" ~ 7"
ROD SIZE	1" ~ 4"
STROKE	2" ~ 310"
SEAL	Hallite, NOK, Aston (according to Customer's require)
PORT	SAE, NPT, NPTF, BSP, GOS

Reliability

- Fast **provision** of replacement parts overnight due to own stock-keeping.
- Hardware components are independent and can be easily exchanged. If individual assemblies are no longer available after a longer period of time, it is possible to switch to other systems without any major difficulty.
- Existing safety equipment can be integrated into our control system. The safety technology can be updated at the customer's request.
- Certification in accordance with CE can be implemented as an optional extra.
- Modernizations and conversions are also implemented by us in-house at the customer's request.
- A new control system is the cost-effective alternative to purchasing a new cutting machine.
- Short retrofitting time of just around 2 days. Our control system is supplied fully pre-tested.
- All servomotors are supplied with prefabricated adapter plates. The old motor is simply replaced with the new one. There is no

need to make any adaptations on-site, which significantly reduces the conversion time.

- User-friendly control system interface with a very short familiarization phase. After just a few hours, the user is able to work independently with the new control system. This means no laborious, time-consuming training is required.
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COST ESTIMATION

Cost of any equipment is majorly effect on product so any design the cost analysis is must be necessary to manufacture it. This cost is estimated cost it's made by approximation judgment for manufacturing a one machine.

Sr. no	Component	Estimated cost (rs.)
1	Milling machine	3,15,000/-
2	Hydraulic power pack	2,00,000/-
3	Magnetic chuck	3,00,000/-
4	Servo motor	1,00,000/-
5	Servo controller	36,000/-
6	PLC	70,000/-
7	Computer set	40,000/-
8	Control switches	5,000/-
9	L-M guide ways	1,50,000/-
Total		12,16,000/- approx.

Additional features

It have some more additional feature to reduce the human error or continuous observation. We can also says MSGC is one type of retrofitted milling machine. MSGC is also available as per customer requirement.

- Automation
- More than one object capacity
- Full proofing
- More than one cutter

- Available in customer requirement

III. CONCLUSION

After study of all above we conclude to we can use hydraulic system for work piece motion. Hydraulic system has good accuracy in input signal also it have high load carrying capacity with compact size. Also as per MSGC application the tool wear are increased compare to normal condition of material removing process so we can change the tool material to increase the tool life.

IV. REFERENCES

- [1] De Vries, D. (1910), *Milling machines and milling practice: a practical manual for the use of manufacturers, engineering students and practical men*, London: E. & F.N. Spon. Coedition, New York, Spon & Chamberlain, 1910.
- [2] Jacek F. Gieras (3 June 2011). *Permanent Magnet Motor Technology: Design and Applications, Third Edition*. CRC Press. pp. 26-. ISBN 978-1-4398-5901-8. <https://books.google.com/books?id=rFrFLUTri0MC&pg=PT26>
- [3] Hunter, Louis C.; Bryant, Lynwood (1991). A History of Industrial Power in the United States, 1730-1930, Vol. 3: The Transmission of Power. Cambridge, Massachusetts, London: MIT Press. ISBN 0-262-08198-9.
- [4] *Management of Hazardous Energy: Deactivation, De-Energization, Isolation, and Lockout*, Thomas Neil McManus, page 678, August 8, 2012 by CRC Press, Reference - 942 Pages - 273 B/W Illustrations, ISBN 9781439878361
- [5] *Fisher Controls International Emerson Process Management*. <http://www.documentation.emersonprocess.com/groups/public/documents/book/cvh99.pdf>
- [6] <http://www.omega.com/auto/pdf/SimpValvesguide.pdf>
- [7] Barkhuus, Louise; Polichar, Valerie E. (2011). "Empowerment through seamfulness: smart phones in everyday life". *Personal and Ubiquitous Computing*. 15 (6): 629–639. doi:10.1007/s00779-010-0342-4. Retrieved 7 March 2015. <https://link.springer.com/article/10.1007/s00779-010-0342-4>
- [8] "The father of invention: Dick Morley looks back on the 40th anniversary of the PLC". *Manufacturing Automation*. 12 September 2008.
- [9] "PLC Security Risk: Controller Operating Systems Tofino Industrial Security Solution".
- [10] "Induction (Asynchronous) Motors" (PDF). Mississippi State University Dept of Electrical and Computer Engineering, Course ECE 3183, 'Electrical Engineering Systems for non-ECE
- [11] Merzouki, Rochdi; Samantaray, Arun Kumar; Pathak, Pushparaj Mani (2012). *Intelligent Mechatronic Systems: Modeling, Control and Diagnosis*. Springer Science & Business Media. pp. 403–405. ISBN 144714628X. Archived from the original on 2016-12-03.