Direct Machining of Gears on 5-Axis CNC

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Introduction & Serving Fields

PUSHPAK TRADEMECH LIMITED is among the most technologically advanced gear manufacturers in Gujarat – INDIA, and takes this pleasant opportunity to introduce ourselves as a pioneer of gear machining with highly advanced 5-Axis CNC technology. Our modern facility is equipped with full range gear manufacturing of Girth Gear & Pinion, Spiral Bevel gear & pinion, SPM Gear box, Worm shaft & Worm gear, Herringbone Gears, Planetary Gears & Gear Boxes, Annulus Rings, Yaw Rings, Sprockets, Gear couplings and also Rack and Pinion / Toothed Bearing for swing Gear assembly.

PUSHPAK, Gujarat’s leading gear manufacturing company, has been an integral part of Gear Manufacturing industry for the past 30 years. The range of products from PUSHPAK is driven by end user needs. This is the reason for us to immerse ourselves in the demands of the industry. PUSHPAK is of the opinion that the best way to solve a problem is to think out of the box & look at it from every possible aspect.

Our head office is in Ahmedabad, Gujarat, INDIA and we have establishments all over INDIA, Australia and South Africa. Our engineers are well acquainted in finding solutions to different client requirements.

- Power Plants.
- Mining Industries.
- Cement Plants.
- Tyre Industries.
- Metals & Tubes Industries
- Aviation Sector.
- Auto Mobile Industries.
- Wind Mill Sectors.
### 5 AXIS - GANTRY MOVING VERTICAL MACHINING CENTER

- **Functions**
  - “X” Axis Travel : 4000 mm
  - “Y” Axis Travel : 8500 mm
  - “Z” Axis Travel : 2500 mm
  - “A” Axis Travel : ± 120’
  - “C” Axis Travel : 360’ Continuous.

- **Accuracy** : ± 0.005 mm/meter.

- **Speed**
  - Spindle : 18,000 RPM.
  - Feed Rate : 40,000 mm/min.

- **Load Capacity**
  - Table Capacity : 320 M.T.

- **Make**
  - Company : BRETON
  - Country : ITALY
  - Mfg. Year : 2010
3 AXIS VERTICLE MACHINING CENTER

- **Function**
  - "X" Axis Travel: 2000 mm.
  - "Y" Axis Travel: 1000 mm.
  - "Z" Axis Travel: 600 mm.

- **Attachment:**
  - With 4 Axis rotary table dia. 300 mm.
  - With 5 axis tilting rotary table.

- **Make**
  - Company: BFW (INDIA)
  - Model: BMV 70
  - Mfg. Year: 2003
Facility Under One Roof

- **3 AXIS VERTICAL MACHINING CENTER**
  - X - Axis Travel : 800 mm
  - Y - Axis Travel : 300 mm
  - Z - Axis Travel : 400 mm

- **3 AXIS GANTRY MOVING VERTICAL MACHINING CENTER**
  - X - Axis Travel : 3000 mm.
  - Y - Axis Travel : 1500 mm.
  - Z - Axis Travel : 800 mm.

- **GEAR HOBBER**
  - Table size : Ø 2000 mm.
  - Module : 45

- **VERTICAL LATHE**
  - Height : 1000 mm.
  - Turning Dia. : Ø 1500 mm.

- **HORIZONTAL LATHE CONVENTIONAL**
  - Length : 1000 to 12,000 mm.
  - Turning Dia. : 1000 mm.
Design & Programming

Working with expertise manpower and worlds leading CAM services, PUSHPAK facilitate with HYPER-MILL 5-Axis Think-3 CAM software which acquire both simple and complex geometries can be programmed efficiently. Work pieces can be completely machined in a single setup thanks to the broad range of machining strategies. The advantages continuous and more efficient processes, Reduced processing times and higher reliability. In addition this can offers several options for automated programming, Reducing machine cycle times and optimizing processes. Examples of this include sophisticated feature and macro technology, Automated functions such as mirroring and transforming, Functions that minimize auxiliary processing times such as job linking or production mode, And fully automated collision checking and avoidance.
With over 30 years of machining experience, PUSHPAK have the right machines for doing the right job, and the right technology for the right situation. PUSHPAK expertise in innovation and creativity for precision machining and support equipment's for the various energy sectors. It’s more than manufacturing that PUSHPAK has established a strong foothold in precision machining industry. Precision machining achieved through highly advanced CNC machine shop, connected with sophisticated design and cam software’s.
PUSHPAK’s advanced inspection technology is comply with The Renishaw RMP600, A Compact High accuracy touch probe with radio signal transmission, offering all the benefits of automated job set-up, plus the ability to measure complex 3D part geometries on all sizes of 5-axis machine. The most advanced points is that the RENISHAW-RMP600 is inbuilt with PUSHPAK’s machine control, and having the facility of “OMV” on machine verification of the component, RMP600 brings unrivalled performance in terms of 3D measurement. Use the RENISHAW - OMV for advanced on-machine verification when machining contoured surfaces, complex shapes and critical profiles of the work piece. As the result of OMV the user get software generated dimensional reports, means less human interface will achieves the better quality.
Get Customer Data such as Drawing / Geometrical Data

Proof Machining of the Gear or Pinion by using the CAM program.

Process of Heat Treatment as Required.

After Getting desired tolerances, Proceed for dispatch.

Create Gear or Pinion Model in KISSsoft.

Create CAM program using HyperMill CAM from obtained 3D Model

Final Machining of Gear or Pinion Tooth Cutting.

Final Inspection through “RENSHAW - OMV”

After Getting desired tolerances, Proceed for dispatch.
Girth Gear / Spur OR Helical 3D CAD model Generated using KISSsoft, by applying the Gear Geometrical data which obtained from drawing or specification.
Worm Gear & Shaft 3D CAD model Generated using KISSsoft, by applying the Gear Geometrical data which obtained from drawing or specification.
3D Gear Models from KISSsoft And Machining on CNC

Spur / Helical Gear

- Spur & Helical Gear & Pinion Shaft 3D CAD model Generated using KISSsoft, by applying the Gear Geometrical data which obtained from drawing or specification.
3D Gear Models from KISSsoft And Machining on CNC

- Spiral Bevel Gear & Pinion 3D CAD model Generated using KISSsoft, by applying the Gear Geometrical data which obtained from drawing or specification
3D Gear Models from KISSsoft And Machining on CNC

Internal Toothed Gear / Annulus

- Internal Toothed (Annulus Ring) 3D CAD model Generated using KISSsoft, by applying the Gear Geometrical data which obtained from drawing or specification.
Herring Bone Gear known as Double Helical, 3D CAD model Generated using KISSsoft, by applying the Gear Geometrical data which obtained from drawing or specification.
KISSsoft is one stop solution for designing and calculating all types of gears geometry with reference to its applications - such as “Spur” “Helical” “Worm” “Bevel” “Herringbone” “Internal Toothed” “Spline” etc.

In the most engineering industries, there were single common problem arises for “Original Designs of old Components (Gears)” KISSsoft is one of the solution in this case. It will be effectively useful in reverse engineering systems for reach to the original correct geometry of the traditional gears.

While manually calculation of geometry, it requires more working hours. But while using KISSsoft it shall be one sitting profile generation of Gears. And it is very useful to reduce time lapses in Gear Designing and Product Implementation.

It only needs to be input the basic data of required gear product like “OD” “No. of Teeth” “Modules” etc. and the complete gear geometry of entire gear will be developed in KISSsoft Generated Report.

Many of the Gear Industries have common threat about disclosing their common gear geometry, hence they shall manipulating standard gear data. But while adopting KISSsoft we can generate and finds complete accurate gear profiles even though some of the gears having odd modules.

Gear Profiles can be generated as per norms and design of most recognised internationally standards as well as institutions, Like “AGMA” “DIN” “ISO” etc. KISSsoft having its approval of above international standards, hence it will effectively useful for every gear manufacturer in this regards.
User can generate 3D / 2D CAD Model of Gears in various type of required extension format such as STEP and Parasolid which can be used for generating NC codes in any CAM software.

Effectively calculated below mentioned geometrical data:

- Tooth to Tooth Contact Profile (Redial & Tangential)
- Various Pitch Deviations.
- Normal Pressure Angles.
- Tooth Profile Designs.
- Tooth Profile Deviations.
- Helical Tooth Angle Deviations.
- Various Co-efficient in Geometry.
- Various Dimensional Parameters.
- Variants in Selection of MOC.
- Lubrication Selection of Product as per its application.
- Informing Safety Factors of Product while in action.

How do you find KISSsoft Useful?
Replacement of any Gears or Pinion shall be effectively easy, No need to change entire set of Gear / Pinion Set and Gear Sectors in Segment Gear.

Less prone to geometry distortion (Like, Module of some Gear is odd like "20.123", which is only possible in CNC machining)

All operation of machining like Facing / Tooothing / Joint Hole Machining shall be completed in single set-up.

The Machining is being applied in stable temperature on machine cabin, It’s Necessary for Preventing Material Expansion / Shrinkage.

The Machining can be carried out very smoothly after Heat Treatment Process, No Hardening Material Problem will occurred.

Dependent only on heat-treatment and machining v/s Hobbing, grinding, heat treatment.

The Ball Shaped Solid Carbide Milling Inserts are used for machining, Ground Finish Can be achieved through final machining.

Through using the Highly Advanced Machining Technology and Sophisticated designing software, Accuracy level can be attain Upto “±0.005mm/ Mtr.”

All required Gear Data generated through most advance computerised technology, So the main threat of human error shall be effectively decreased.

Less Human Interface shall be achieved highly cumulative product design.
Hence the limitation is very limited in the machining through CNC, but there is always two sides of coin, same as some of limitations are as follows.

- Machining and completion time shall be taken high compare to conventional. (Like: A Spiral Bevel Gear with “OD of 600mm” shall be machined on CNC takes 4 Days to complete. AND the same bevel gear shall be completed on conventional within 02 Days.
- The Product end cost shall be goes high in comparison with conventional product.
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