Timing Belts
Timing Belts

- Economical means to transfer power
- Meshing between belt teeth and those of the sprocket
- Clean
- No slip characteristic.
Origins of the Timing Belt

- Trapezoidal profile developed in the early 1930’s by the Gilmer company (purchased by Uniroyal in 1940) in the USA
- Development motivated by the textile Industry demands
- The technology quickly embraced by Europe
- Uniroyal begin development of the HTD (Curvilinear profile) early 1960’s
Origins of the Timing Belt

- Uniroyal introduces the HTD in 1969.
- Gates begin development of Poly Chain in the 1980’s.
- Pirelli introduces the RPP Parabolic profile in 1986.
- Dayco purchase Pirelli “PTI” in 1993
Timing Belts
(Synchronous Drives)

• Provide a compact, resilient synchronous transmission and are used in industrial, agricultural, mining and automotive industries
• Available in a large range of sizes and styles
• Three profiles Trapezoidal, HTD, RPP
• Varying degree of performance capabilities
• They allow synchronous power transmission without slip, like chain and gears the power is transmitted by engagement of the belt teeth with that of the sprocket.
• They can be used at relatively high speeds due to their lightness and minimum thickness.
Timing Belts
(Synchronous Drives)

- They allow the design of compact drives due to their high load capacity and their superior flexibility to wrap around smaller sprocket diameters
- Smooth starting and running
- Cover extremely wide power ranges and driven speeds
- Act as “safety fuse” as they refuse to transmit severe overload of power
- They require no lubrication
- Wear gradually making preventative maintenance simple and easy.
Trapezoidal Timing Belts
**Trapezoidal Timing Belts**

- The most prestigious of synchronous power transmission belts.
- Developed by the Gilmer Company in the early 1930’s for the textile industry.
- Also known as Isoran
- Recognised in the market by the square tooth profile.
- Available in a wide range of sizes
- Cross section available (MXL, XL, L, H, XH & XXH).
Trapezoidal Construction

- Fibre glass tensile member
- Body of synthetic rubber compound
- Nylon tooth facing.
Trapezoidal Features

• Fibre glass tensile member
  – High breaking load
  – Good resistance to repeated flexing

• Belt Body Synthetic rubber (polychloroprene)
  – Good resistance to fatigue
  – Resist heat, oil & ozone
  – Ground back top width

• Nylon Tooth Facing.
  – High resistance to abrasion
  – Low coefficient of friction
  – Increase meshing smoothness
  – Extended sprocket & belt wear
Trapezoidal Operating Principle

- Transmission of power through teeth engagement with those of the sprocket
- Square tooth profile allows engagement on tooth side.
Trapezoidal Profiles

1/5 in. Pitch Extra-Light (XL)

3/8 in. Pitch Light (L)

1/2 in. Pitch Heavy (H)

7/8 in. Pitch Extra-Heavy (XH)

1 1/4 in. Pitch Double Extra-Heavy (XXH)
Explanation of Part Numbers

300L100

• 300 - 30.0” Pitch Length
• L - 3/8” (L) Tooth Pitch
• 100 - 1.00” Belt Width.
Advantages of Trapezoidal Timing Belts

- They allow synchronous transmission eliminating slippage & speed variation
- They have low installation tension reducing loads on bearings and support brackets
- They are quiet and require no lubrication
- Cover a wide speed range 0.5 MPS - 51 MPS
- Power ranges up to 150 kW.
Limitations Trapezoidal Timing Belts

- Severe shock loads
- Extreme misalignment
- Limited power ratings due to shallow tooth profile
- Susceptible to tooth jump on high torque drives.
HTD Timing Belts

(High Torque Drive)
HTD Timing Belts
(High Torque Drive)

- Developed by Uniroyal in 1969
- Developed as a high performance timing belt to replace existing trapezoidal drives and replace higher power rated mechanical drives
- Known in the market as curvilinear profile due to its round teeth
- Available in wide range of sizes
- Cross sections available (3M, 5M, 8M, 14M & 20M).
HTD Construction

- Fibre glass tensile member
- Body of synthetic rubber compound
- Nylon Tooth Facing.
- Deep groove curvilinear tooth profile.
HTD Operating Principle

- Transmission of power through teeth engagement with those of the sprocket
- Curvilinear profile increases tooth contact with sprocket allowing for higher power ratings.
**Explanation of Part Numbers**

800-8M-30

- **800** - 800 mm Pitch Length
- **8M** - 8 mm (8M) Tooth Pitch
- **30** - 30 mm Belt Width.
Advantages of HTD Timing Belts

• They allow synchronous transmission eliminating slippage & speed variation on high torque drives.
• They have low installation tension reducing loads on bearings and support brackets.
• They are quiet and require no lubrication.
• Cover a wide speed range 0.5 MPS - 51 MPS.
• Covers wider range of power up to 200 kW.
• Curvilinear profile improves resistance to tooth jump.
Limitations HTD Timing Belts

- Severe shock loads
- Extreme misalignment
- Profile can generate high noise levels on high torque drives.
- Limited power ratings at higher level.
RPP Parabolic Timing Belt

- Developed by Pirelli in 1986
- Developed as an improvement to existing deep groove synchronous belts
- Available in wide range of sizes
- Cross sections available (3RPP, 5RPP, 8RPP, 14RPP & 20RPP).
RPP Operating Principle

- Transmission of power through teeth engagement with those of the sprocket
- Parabolic profile increases belt and sprocket surface contact enable to transmit more power
- Tooth recess provides soft mesh by means of local elastic deformation and improves tooth engagement.
1. Precision ground back neoprene rubber for resistance to oil, heat, ozone and flex fatigue.
2. Fibreglass cords with S & Z construction improves belt tracking.
3. Teeth precisely formed and accurately spaced for smooth, uniform transfer of power.
4. Special patented Nylon belt facing impregnated with graphite provides maximum drive efficiency and exceptional resistance to tooth shear and wear.
5. Tooth recess provides soft mesh and improves engagement of the belt tooth. A reduction in noise is achieved due to the lateral discharge of air between the belt and sprocket.
RPP™ Belt Noise Comparison Test

Test condition: 1750 RPM, 1:1 ratio, 2100-14M-40 belt size, 36 groove sprockets

dBA

RPP PARABOLIC PROFILE

STANDARD CURVILINEAR PROFILE

BELT & SPROCKET COMBINATION

Test data compiled by an independent manufacturer of power transmission products
RPP Available Profile
Explanation of Part Numbers

800RPP8-30

- 800 - 800 mm Pitch Length
- RPP8 - 8 mm Tooth Pitch
- 30 - 30 mm Top Width.
Advantages of RPP Profile

- They allow synchronous transmission eliminating slippage & speed variation on high torque drives
- They have low installation tension reducing loads on bearings and support brackets
- They are quieter than comparable timing belts and require no lubrication
- Cover a wide speed range 0.5 MPS - 51 MPS.
- Covers wider range of power up to 200 kW
- Rpp profile reduces sprocket wear
- Higher power ratings allow smaller widths to be used than trapezoidal timing belts
- Interchangeable with existing deep groove profiles (HTD).
Limitations RPP Timing Belts

- Extreme shock loads
- Severe misalignment
- Limited power rating at higher level
RPP HRP®
High Power Rating
HPR Timing Belts

- Developed by Pirelli as a high performance product above existing RPP & HTD profiles.
- Available in wide range of sizes
- Available in 8HPR & 14HPR cross sections
- Also referred to as RPP Plus
HPR Construction

• Has all the construction and benefits of the RPP standard profile. Ground back, tooth recess, fibreglass cords, etc

• With the inclusion of double nylon facing impregnated with graphite, it unlocks higher power ratings and greater torque rating by up to 50%.
Horsepower Rating Comparison

RPP™ belt versus RPP™ PLUS belt

power rating

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RPP

RPP PLUS

BELT TYPE
HPR Benefits

• Improved tooth meshing providing decrease in sprocket wear and reduction in noise.

• Increased power ratings providing design freedom and subsequent reduction in belt width.

• Interchangeable with existing deep groove profiles RPP & HTD resulting in greater life for existing drives without changing sprockets.
Pat Number Explanation

2000HPR14-85

- 2000 - 2000 mm Pitch Length
- HPR - Denotes Construction
- 14 - 14 mm Tooth Pitch
- 85 - 85 mm Top Width.
HIGH PERFORMANCE TIMING BELTS
High Performance Timing Belts

- Two common styles of High Performance timing belts
- Rubber construction (Panther)
- Urethane construction (Poly Chain)
- Power ranges up to 500 kW
- Aimed at replacement of large V-belt drives and mechanical drive systems.
Urethane Timing Belts

- Produced by Gates and commonly named Poly Chain
- Tooth profile is curvilinear and is available 8mm & 14mm pitch
- Special sizes produced
- Top widths supplied unique to poly chain.
- Specially manufactured sprockets to handle high loads imposed by the belt.
Construction
Urethane Timing Belts

• Kevlar Cord tensile members
  – High breaking load
  – Excellent for shock loads
  – Flexible

• Urethane Body
  – Excellent for product stability
Urethane Timing Belts

**Advantages**
- Up to 100% higher power ratings than standard timing belts
- More compact drive capability
- Reduced noise than mechanical systems
- Clean no lubrication required.

**Disadvantages**
- Urethane melts in severe heat. Rated temperature 82°C
- Urethane hard on sprockets.
- Unable to accept backside idlers.
Power Transmission Products
RPP Panther™ Synchronous Drives

• “Chain” Horsepower without the mess
• Horsepower ratings comparable to Urethane, PLUS Backside Idler capacity, better heat resistance, lower drive noise
• Performs at 98% operating efficiency for reduced energy consumption
• Patented Graphite-loaded, self-lubricating, double nylon cover resists ozone, friction wear, and abrasion
Panther Timing Belts

- Introduced by Dayco in 1994
- Developed to replace chain & gear drives, and to upgrade synchronous systems or V-belts
- Aimed to improve on the characteristics of Urethane belting.
1 **Precision ground back rubber**
   - for resistance to oil, heat, ozone and flex fatigue

2 **Aramid Cords**
   - Extremely high breaking load
   - Excellent absorption to shock
   - High flexibility
   - S & Z twist improves tracking.
3 Double Cover Nylon Tooth Facing (graphite)
   - Exceptional resistance to abrasion
   - Increases drive efficiency
   - Increase pulley & belt life
   - Improves load carrying ability.

4 Aramid Fibre Blended Body
   - provides excellent flexibility and strength
   - Superior heat resistance
Power Rating Comparison %
Part Number Explanation

• 3350PTH14-120

• 3350 - 3350 mm Pitch Length
• PTH - Denotes Construction
• 14 - 14 mm Tooth Pitch
• 120 - 120 mm Top Width.
The Panther Advantage

- Achieves a level of performance previously only possible with mechanical systems (chains, gears, line shafts, etc)
- Maximum operating efficiency up 98% through a wide range of operating speeds.
- Smooth performance
- Constant tension
- Anti-Static properties in accordance with BS 2050 as standard construction.
The Panther Advantage

- Quieter than mechanical systems and polyurethane belt
- Temperature resistance up to 100°C
- Suitable for backside idlers
- No lubrication required.
- Specially manufactured sprockets to ensure drive function as a precision gear system.
Drive Design Software: Synchronous and V-Belts
How efficient are your V-Belt Drives?

NEW from DAYCO

Dayware V-Belt Drive Design Package

The Dayco Dayware Drive Design package can:
- Improve drive efficiency & life
- Reduce down time
- Provide complete tensioning and hub load data
- Select up to 12 drives to meet your exact requirements
- Analyse existing drive designs
- Save time and money
- Result in reduced V-Belt inventory

The custom software package for IBM PC, XT, AT, PS/2 and compatible