DIESEL MECHANIC

MINING QUALIFICATIONS AUTHORITY

CODE: DVB

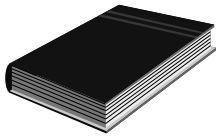
TENSION AND ALIGN V-BELTS

Created : 01 February 2003
Revised : March 2015
Owner : Learnership Department

First Published : March 2003
Revision No: 002
TRG 9

INDEX

The following elements are contained in this learning guide:



SOURCE REFERENCES

Demonstration by a competent person, e.g. a Training Officer.

Audio-visual aids if available.

Display board in the training centre.

OBJECTIVE

You will be learning towards the outcome “Tension and align V-belts”. Whilst learning towards the outcome you will be required to achieve the following:

- Fit, align and tension V-belts, and
- Maintain V-belt drives.

On completion of this module, the learner must be able to:

- Measure and select the appropriate V-belts for a given drive (including matched sets).
- Fit, align and tension V-belts.
- State the five main points to be checked when maintaining a V-belt drive.

During this process you must adhere to certain specified requirements as listed in the Module.

ASSESSMENT AND EVALUATION CRITERIA

You will be assessed, when you are confident that you may achieve the outcomes as listed, to determine your competence as measured against the required criteria. This assessment will be in line with accepted best practices regarding assessment.

- Practical test will be set during the module and must be completed without using references other than a standard chart for V-belt tensioning forces.
- The learner will be given a V-belt drive, an assortment of V-belts (which may include matched sets), the necessary tools and equipment and a standard chart for V-belt tensioning forces, and must select the appropriate V-belts for the drive to fit, align and tension them.
- The following standards must be achieved:
  a. The correct V-belts must be selected for the given V-belt drive.
  b. There must be adequate slack in the V-belt when removing or replacing it so as not to injure the learner’s hands or damage the V-belts or pulleys.
  c. All four points of the pulleys must touch the plumb line (string) or straight edge. Tolerance allowed: If a 0.05mm feeler gauge is inserted between the straight edge and the pulley, it may not travel more than 25% of the pulley diameter.
  d. The tension must be adjusted according to the standards specified in the chart within the limits of + 0.5 kgf and - 0.0 kgf.

e. The safety guard must be fitted before testing the unit.
f. When the unit is loaded so that the motor draws maximum rated current for 10 minutes, there must be:
    - No slip (indicated by a squeak),
    - No whip, and
    - No excessive noise.
g. There must be no damage to tools and equipment.

- All safety procedures must be adhered to.

HAZARD IDENTIFICATION AND CONTROL (HIAC) FORM

DVB

TENSION AND ALIGN V-BELTS

STEPS IN OPERATION / PROCESS	POTENTIAL ACCIDENT / INCIDENT	CONTROLS (BY RESPONSIBLE PERSON)
1. Use hand tools.	• Using damaged tools or wrong tools for the job can cause injury and damage to equipment.	• Always use the correct tool for the job. • Ensure tools are in good condition. • Use tools correctly. • Wear appropriate PPE where necessary. • Always take good care of tools. Maintain, clean and store it properly.
2. Work on machinery.	• Injury to person if working on moving machinery.	• Ensure that power to the machine is switched off, and locked out. Place a warning sign stating: “Men at work. Do not switch on” in a prominent position. • Ensure that machinery is stationary before commencing work. • Replace machine guards after completing the task an before starting the machine.

NOTE: Before doing the practical work contained in this module, the learner must study the content of the above HIAC form again and then sign the statement below.

The above risks, which will be encountered in this module, are fully understood and will be controlled during the practical work.

Signature of learner: _____

Signature of Training Officer: _____

Date: _____

DICTIONARY

V-belt : A band of material in a wedge or V-shape, which fits over pulleys of the same shape and is used to transfer power in machines.

Align : To bring in to line, or to put in a straight line.

Tension : The degree of tightness in a V-belt.

Tensioning force : The specified force in Newton (N) or kilogram – force (kgf) required to deflect a V-belt 16mm for every 1 meter span, and is used to measure if the V-belt is correctly tensioned.

Idler / guide pulley : An intermediate pulley that runs free (i.e. it's not driven), used to take up slack in a V-belt.

Slip : The reduction in the movement of a pulley due to slipping of the V-belt.

1. SELECTING V-BELTS

ITEM / TASK: Introduction.

DESCRIPTION:

A. V-belt drives are used on many machines in the industry, e.g. pumps, crusher motors, etc.
B. They are not as efficient as direct drives, because there is a loss of efficiency between the V-belts and the pulleys due to friction and slip.
C. Because they are used so much they need checking as part of routine maintenance work. Any faulty parts must be corrected or replaced.

ITEM / TASK: Types of V-belts.

DESCRIPTION:

There are two basic types of V-belts available, namely:

- the standard type, and
- the wedge type.

A. **The standard type.** (See the display board)

- The standard type V-belt is made of rubber and fabrics, and can be identified by its cross section profile. It has a flat surface at the top and at the bottom. (Fig 1)

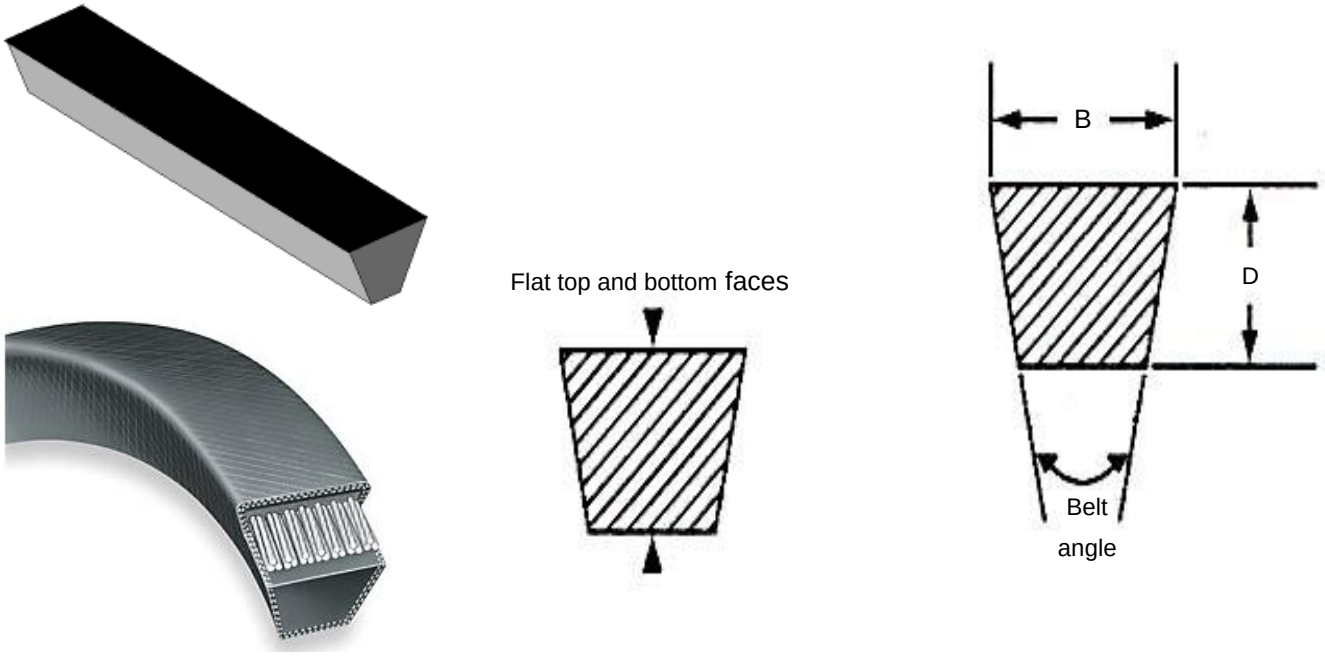


FIG 1.

- The size of a standard type V-belt is given by two dimensions: Its maximum width (B) and depth or thickness (D). See Fig 1 on previous page.

- There are five standard sizes.

  i. 13mm x 8mm called an “A” section.
  ii. 17mm x 11mm called a “B” section.
  iii. 22mm x 14mm called a “C” section.
  iv. 32mm x 19mm called a “D” section.
  v. 38mm x 23mm called an “E” section.

B. **The wedge type V-belt.** (See display board)

- The wedge type V-belt is also made of rubber and fabrics.
- About two thirds of the distance from the bottom of the V-belt there are polyester load carrying cords. These cords make it possible to transmit more power with a smaller V-belt.
- The V-belt can be identified by its convex form at the top and bottom. Fig 2 shows these features.

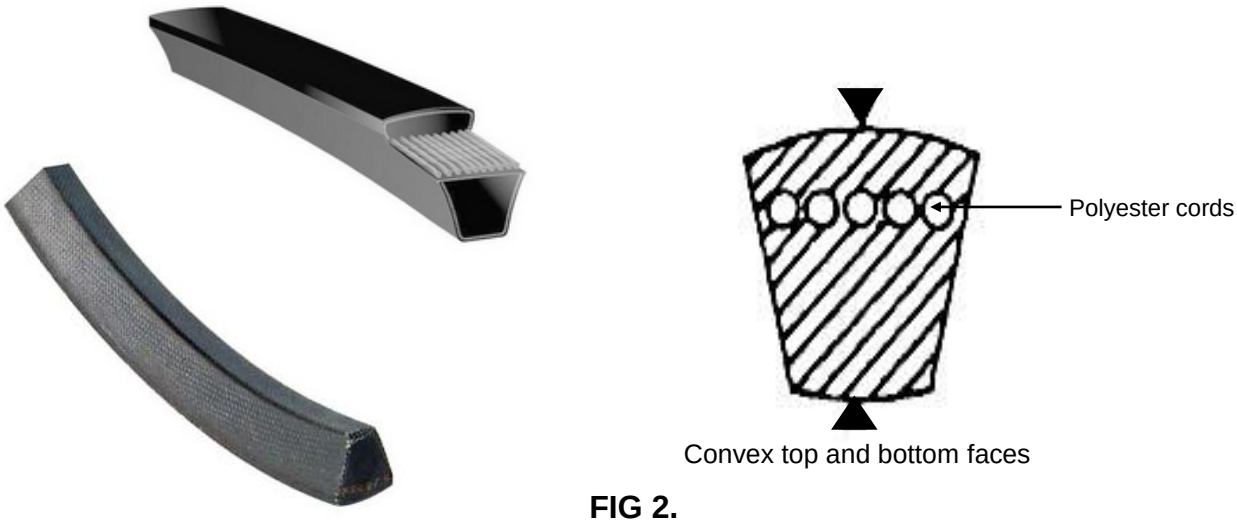


FIG 2.

- The size of a wedge type V-belt is given by its width only.
- V-belts are made with the sides inclined to each other at an angle of 40°. (Refer back to Fig 1) The angle of the grooves in the pulleys generally varies slightly with the diameter of the pulley. Smaller pulleys lie at an angle slightly less than 40° to allow for the V-belt to bulge because of increased bending.

- There are five basic sizes:
  i. 10N called a section “SPZ”
  ii. 13N called a section “SPA”
  iii. 16N called a section “SPB”
  iv. 22N called a section “SPC”
  v. 25N called a section “DELTA”

  The first number, e.g. 13N, indicates the width of the V-belt, which will be 13mm in this example.

ITEM / TASK: Determine V-belt size.

DESCRIPTION:

A. A V-belt gauge is used to determine V-belt sizes. It is fitted over the V-belt and the size of the V-belt is indicated by the letters or numbers, which are in line with the **top surface** of the V-belt. (Fig 3)

B. Fig 3 shows that the wedge type V-belt is a 16N SPB, and the standard type is a D 32x19.

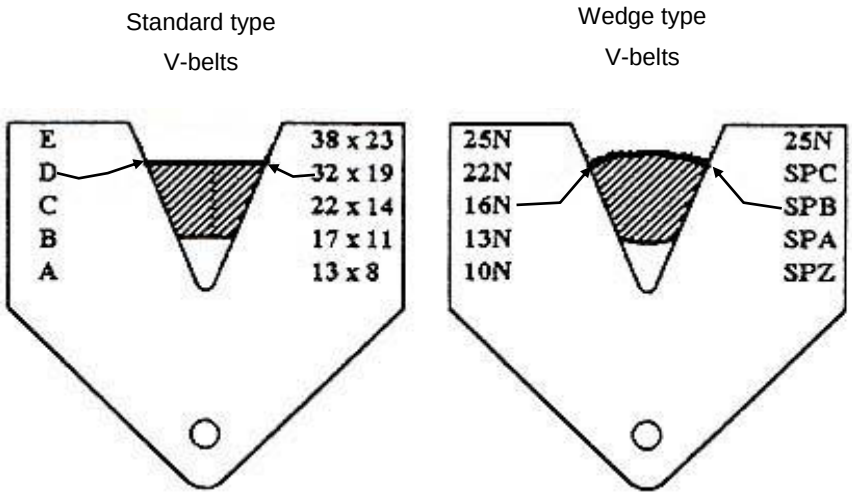


FIG 3.

ITEM / TASK: Measure the length of a V-belt.

DESCRIPTION:

A. The length of a V-belt is normally stated as the length along its neutral axis, which is located approximately two thirds of the distance from the bottom of the V-belt. (Fig 4)

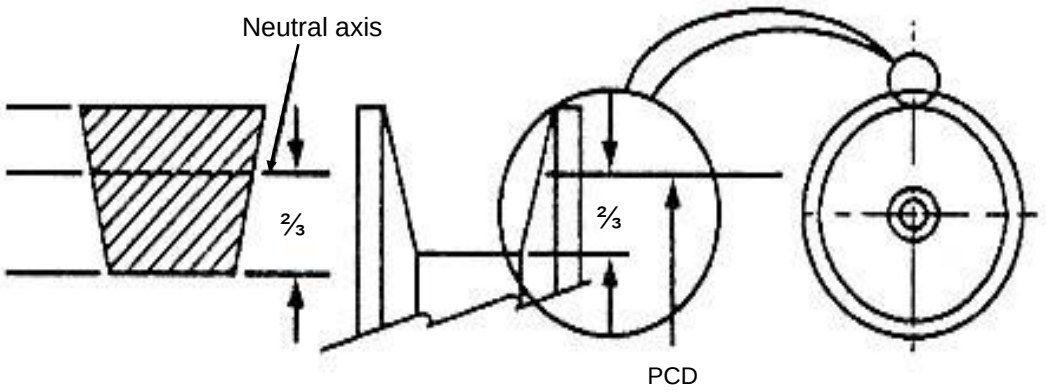


FIG 4.

B. A measuring tape is used to measure the length of the V-belt required.

C. Assume a V-belt has to be fitted between a motor and a jackshaft.

Proceed as follows to measure the length of the V-belt required:

- Move the motor as close as possible to the driven pulley. The driven pulley is the pulley that is mounted on a jackshaft.
- Wrap the measuring tape around the two pulleys, on the same path as the V-belt, and at the bottom of the grooves and take the measurement.
- Because the distance measured is at the bottom of the grooves, select a V-belt one size larger than the measurement taken.

N.B.

This is necessary because the neutral axis of the V-belt must line up with the pitch circle diameter (PCD) of the pulley grooves i.e. the V-belt required is larger than the distance measured for it. (Fig 4)

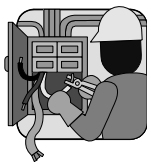
ITEM / TASK: V-belt markings.

DESCRIPTION:

A. V-belt sizes and lengths are usually printed on the belt.
B. In the imperial system, only the size and length are stamped on the V-belt, e.g. A45 means it is an “A” section V-belt and is 45 inches long.
C. In the metric system for **standard type V-belts**, the width, depth and length are printed on the V-belts, e.g. 13 x 8 x 870 means that the V-belt is 13mm wide, 8mm deep and 870mm long. It is an “A” section V-belt because the width and depth is given.
D. In the metric system for **wedge type V-belts**, the number and length are printed on the V-belt, e.g. 16N SPB 3550 means that it is 16mm wide and 3550mm long.

DO THE PRACTICE ON THE NEXT PAGE BEFORE CONTINUING WITH THE REST OF THE MODULE.

PRACTICE



- Measure the given V-belt lengths and sizes with a Vernier calliper and a tape.
- Compare your sizes with those given on the V-belt chart.
- Use the chart to determine the number of the belt and then compare your answers with those printed on the V-belt, or check with a V-belt gauge.

Ask your Training Officer to check your work and if it is correct, to sign below and then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

ITEM / TASK: Matching V-belts.

DESCRIPTION:

A. V-belts are mass-produced and there is always a slight difference in their lengths. This difference is quite critical and cannot be ignored. The reason being that if V-belts of different lengths are fitted to a multiple belt drive the shortest V-belt will take the most load.

B. To overcome this difference, “matched sets” of V-belts must be used.

C. The variation in length of the V-belt from its nominal length (i.e. the length it should be) is either printed on the V-belt or on a cellulose tape attached to the V-belt. A code system is used to indicate the variation.
    - A code number of 50 indicate that the actual V-belt pitch length is equal to the nominal length.
    - For each 2mm variation from the nominal length one unit is added to or subtracted from the 50 depending upon whether the V-belt is longer or shorter, respectively.

D. Consider a wedge type V-belt, type 16N SPD 3550 i.e. the nominal length is 3550mm.
    - A V-belt with a length exactly the same as the nominal length, i.e. 3550mm will have a code number of 50 printed on it.
    - A V-belt 2mm longer than the nominal length, which in this case will be 3550 + 2mm = 3552mm, will have a code number of 51 printed on it.
    - A V-belt 2mm shorter than the nominal length, which in this case will be 3550mm - 2mm = 3548mm, will have a code number of 49 printed on it.

E. When selecting matched sets of V-belts care should be taken to ensure that they fall within the maximum variation limits contained in the V-belt chart on the next page. See second column.

Example :

In the case of the V-belt of length 3550mm, used in C above, the maximum variation in V-belt length allowed (see chart on the following page) is 6mm, i.e. 3 x 2mm. A matched V-belt set in this range must therefore consist of belts that have three consecutive code numbers, e.g. 48, 49, 50 or 49, 50, 51 etc.

V – BELT CHART.

BELT LENGTH (mm)	MAXIMUM VARIATION	EXAMPLES OF CONSEQUTIVE CODE NUMBERS	
630 – 1800	2 mm	50	51
1801 – 3170	4 mm	49 – 50	50 – 51
3171 – 4560	6 mm	48 – 49 – 50	50 – 51 – 52
4561 – 8000	8 mm	48 – 49 – 50 – 51	
8001 and more	12 mm	48 – 49 – 50 – 51 – 52 – 53	

Example 1:

To match a V-belt with length 4560mm and code number 50 stamped on it, look in the 3rd row. Maximum variation is 6mm. Therefore, minimum length of a matching belt may be 4560 – 6 or 4554 mm i.e. It can have a minimum code number of 47 (count 3 numbers back from 50). Similarly, it can have a max length of 4566mm and a code number of 53. Remember that the max difference in length may only be 6mm. A matched set of V-belts may, therefore, only have any of **three consecutive code numbers** in the range of numbers from 47 to 53. E.g. a matched set of five V-belts may consist of belts with code numbers 47, 48, 49, 49, 50 or 50, 51, 52, 52,53.

Example 2:

Match a V-belt of nominal length 2970mm and a code number 49 stamped on it. The code number 49 indicates that the actual length of the V-belt in question is 2mm less than the nominal length, i.e. 2970 - 2 or 2968mm. The V-belt chart shows that maximum variation allowed for matching V-belts of this nominal length is 4mm. Therefore, the min. length of a matching V-belt can be 2968 – 4 or 2964mm i.e. with a code number 47(counting back from 50), and a maximum length of 2968 + 4 or 2972mm and code number 51 (counting forward from 50).

Therefore, matching V-belts may have any **two consecutive numbers** between 47 and 51.

DO SELF TEST 1 ON THE NEXT PAGE BEFORE CONTINUING WITH THE REST OF THE MODULE.

SELF TEST 1

1. What are the allowed differences in the code numbers to make up a matched set for the following V-belts?
   a. Length of the V-belt is 2030 mm with a code number of 50.

   b. Length of the V-belt is 5070 mm with a code number of 48.

   c. Length of the V-belt is 3700 with a code number of 52.

Check your answers against those given below. Ask your Training Officer for assistance if yours are not correct.

Ask your Training Officer to check your work and if it is correct, to sign below and then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

Answers to Self - Test 1:

a. Any two consecutive numbers from 48 to 52.
b. Any four consecutive numbers from 44 to 52.
c. Any three consecutive numbers from 49 to 55.

2. DETERMINE THE TENSIONING FORCE AND DEFLECTION OF A DRIVE BELT

ITEM / TASK: Introduction.

DESCRIPTION:

A. The correct tensioning of a V-belt is critical to ensure that the life span of the V-belt is extended to a maximum and that the belt operates efficiently.

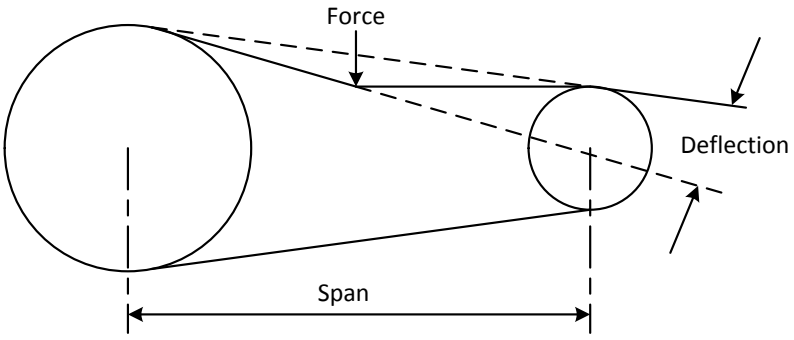
B. To check the tension of the V-belts on a drive a certain force must be applied in the middle of the span of the drive on one of the V-belts. If the drive is correctly tensioned the V-belt must deflect a specific amount.

C. If the V-belt deflects less than this amount it is too tight, and if the V-belt deflects more, it is too slack.

ITEM / TASK: Method of determining the tensioning force and deflection of a drive belt.

DESCRIPTION:

A. Measure the span of the drive, i.e. the distance between the centres of the two pulleys. (Fig 5)



Deflection = 16mm per metre of span

FIG 5.

B. The Standard Chart for Tensioning Forces (Table 1 on the next page) shows the **force required** to **deflect the V-belt** in the middle of its span by **16mm for every 1 metre of span.**

Thus to determine the actual deflection (in mm) allowed for the V-belt in question, multiply the span in metres by 16mm.

Example: For a drive with a span of 1.5 meter.

Deflection = Span x 16mm

= 1.5 x 16mm

= 24mm

C. To determine the tensioning force that must be applied to the V-belt to measure the deflection, proceed as follows:

- Measure the diameter of the small pulley in the drive.
- Determine the V-belt section.
- Use this information to determine the tensioning force in kilogram force (kgf) or newton (N) required from Table 1 below.

TABLE 1 - STANDARD CHART FOR TRNSIONING FORCES.

BELT SECTION	DIAMETER OF SMALL PULLEY (mm)	TENSIONING FORCE : NEWTON (N)	TENSIONING FORCE : KILOGRAM FORCE (kgf)
10N SPZ	67 to 95	10 to 15	1.0 to 1.5
	100 to 140	15 to 20	1.5 to 2.0
13N SPA	100 to 132	20 to 27	2.0 to 2.7
	140 to 200	28 to 35	2.8 to 3.5
16N SPB	160 to 224	35 to 50	3.5 to 5.0
	236 to 315	50 to 65	5.0 to 6.5
22N SPC	224 to 355	60 to 90	6.0 to 9.0
	375 to 560	90 to 120	9.0 to 12.0
13 x 8 A	80 to 140	10 to 15	1.0 to 1.5
17 x 11 B	125 to 200	20 to 30	2.0 to 3.0
22 x 14 C	200 to 400	40 to 60	4.0 to 6.0

Example: Assume the V-belt section is a 22N SPC and that the diameter of the small pulley is 320mm.

According to the table the force required to deflect the V-belt 16mm for every 1 metre of span is 6.0 kgf to 9.0 kgf.

DO SELF TEST 2 ON THE NEXT PAGE BEFORE CONTINUING WITH THE REST OF THE MODULE.

SELF TEST 2

Calculate the **deflection** and determine the **lower and higher values** for the force required to deflect the belt for the following drives.

Refer to Table 1 on the previous page. **Calculations**

a. V-belt section = 13 x 8 A
   Span = 0.65 metres
   Small pulley diameter = 237 mm
   Tensioning force :

b. V-belt section = 16N SPB
   Span = 1.2 metres
   Small pulley diameter = 237 mm
   Tensioning force :

c. V-belt section = 10N SPZ
   Span = 0.9 metres
   Small pulley diameter = 120 mm
   Tensioning force :

Check your answers against those given below. Ask your Training Officer for assistance if yours are not correct.

Ask your Training Officer to check your work and if it is correct, to sign below and then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

Answers to Self-Test 2.

a. Deflection = 10mm Tensioning Force = 1.0 to 1.5 kgf (10 to 15 N)
b. Deflection = 19mm Tensioning Force = 5.0 to 6.0 kgf (50 to 65 N)
c. Deflection = 14mm Tensioning Force = 1.5 to 2.0 kgf (15 to 20 N)

3. TENSIONING V-BELT DRIVES

ITEM / TASK: Tension a V-belt drive using a spring balance.

DESCRIPTION:

A. Determine the tensioning force and deflection for the V-belt as explained in the previous section.

B. Find the middle of the span of the belt between the two pulleys.

C. Attach a spring balance to this point. (Fig 6)

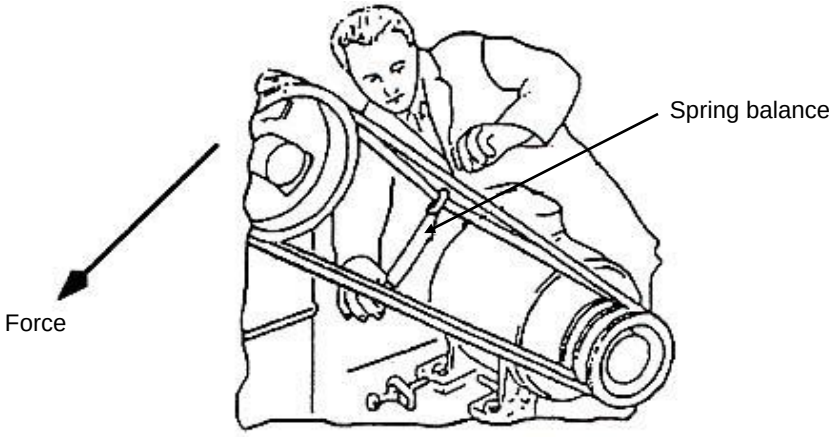


FIG 6.

D. Pull the V-belt out until the required force is indicated on the spring balance.

E. Measure the deflection of the V-belt with a rule (Fig 7) and compare it with the deflection calculated in “A” above.

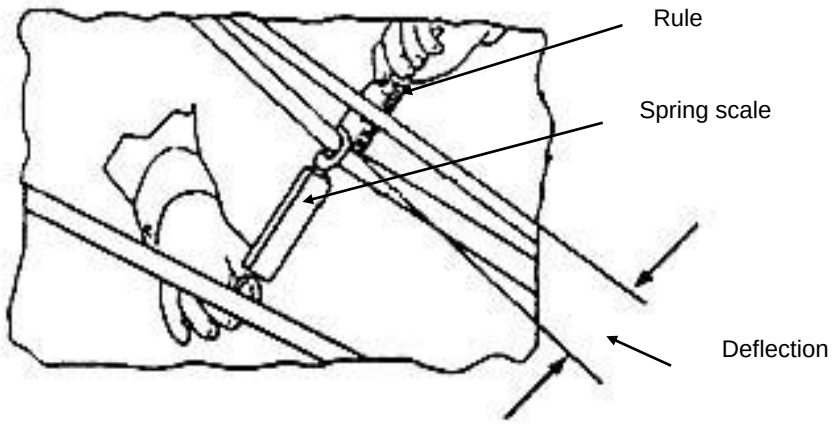


FIG 7.

F. Adjust the tension if necessary. See Fig 8.

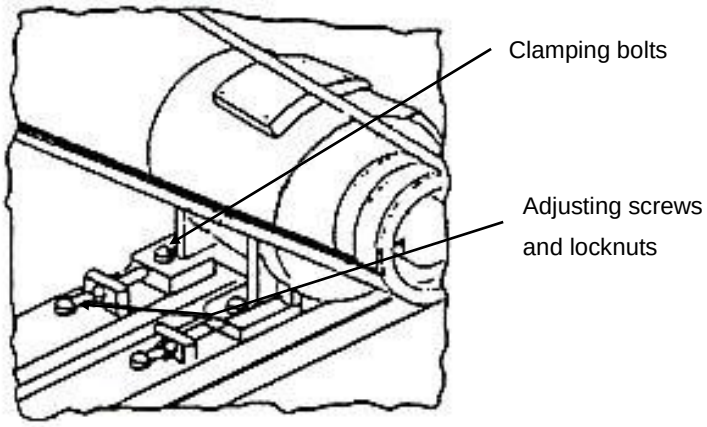


FIG 8.

- Loosen the lock nuts on the adjusting screws.
- Slacken the clamping bolts.
- Loosen the adjusting screws to slacken the tension, or screw them in to increase the tension.

NB.

The adjusting screws must be turned equally to keep the pulleys correctly aligned.

- Tighten the clamping bolts again.
- Nip up the adjusting screws.
- Check the alignment of the set up.

ITEM / TASK: Tension a V-belt drive using a tensioning gauge.

DESCRIPTION:

A. Determine the tensioning force and deflection for the V-belt as explained previously.
B. Find the middle of the span of the V-belt between the two pulleys.
C. Press the tensioning gauge onto the V-belt at this point.
D. Press the V-belt down until the required load is shown on the gauge. (Fig 9 on the next page)
E. Determine the deflection by looking at the millimetre (bottom) scale, and reading the tension (kgf) on the top scale. See Fig 10 on the next page.
F. Adjust the tension if necessary as explained in the previous section.

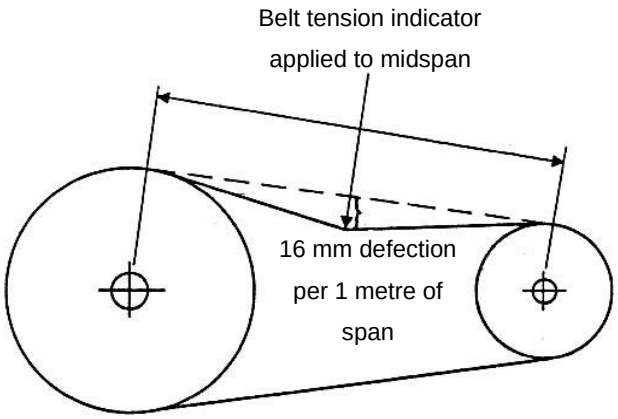


FIG 9.

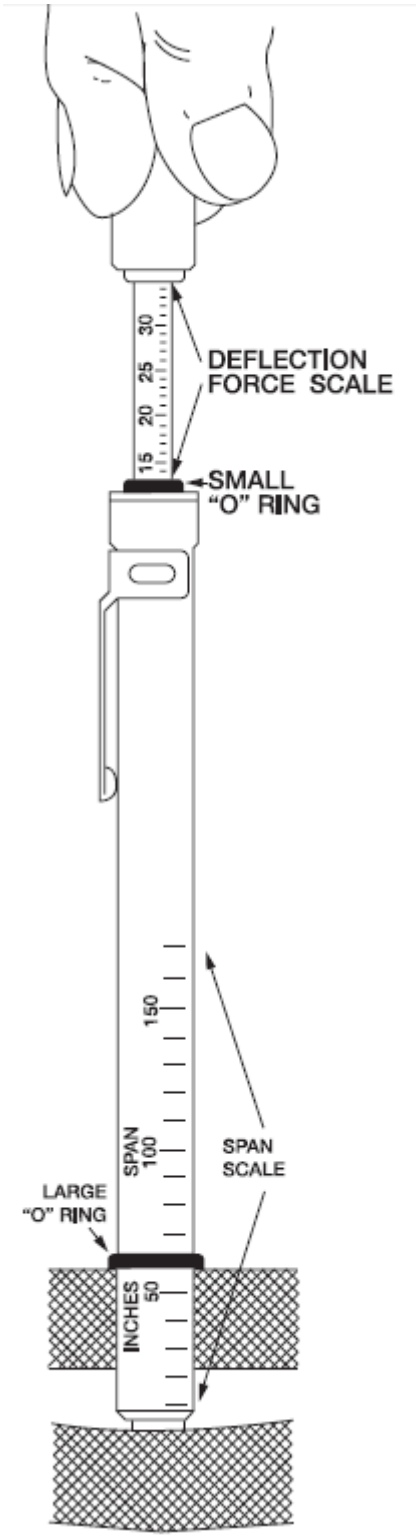


FIG 10.

NB.

A new set of V- belts should be tensioned to the higher value stated in Table 1 to allow for a normal drop in tension during the running-in period.

After the drive has been running for a few hours the tension should be checked and readjusted to the higher value. The tension must be within the limits of +0.5 kgf and -0.0 kgf.

NB.

Never over tension V-belts because this can cause either a failure of the bearings, the motor (driver), or the driven unit. (e.g. a pump etc.)

ITEM / TASK: Use idlers (guide pulleys) to maintain tension in a V-belt.

DESCRIPTION:

A. An idler or guide pulley is also a pulley, but its function is not to transfer energy. Its function is to keep the tension of the V-belt constant, to keep it in place and to increase the arc of contact if installed on the outside of the V-belt.
B. Idlers that are installed to run on the outside of the V-belt (see Fig 11a) must have a flat surface so as not to damage the V-belt.
C. Idlers that are installed to run inside the V-belt (Fig 11b), must have exactly the same groove profile as the other pulleys in the system so as not to cause damage to the V-belts.
D. The idler must be fitted as **close as possible** to the **biggest pulley**. Compare figures 11a and 11b.
E. The idler's diameter must be at least the same as the smallest pulley.

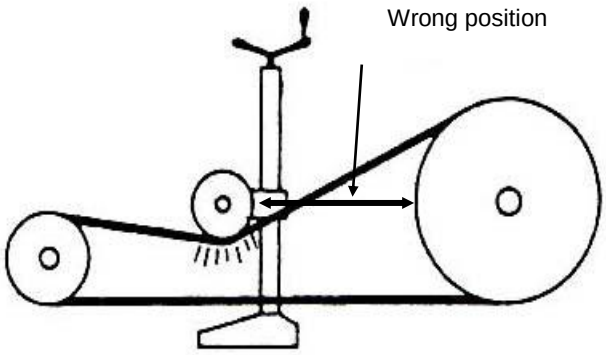


FIG 11a.

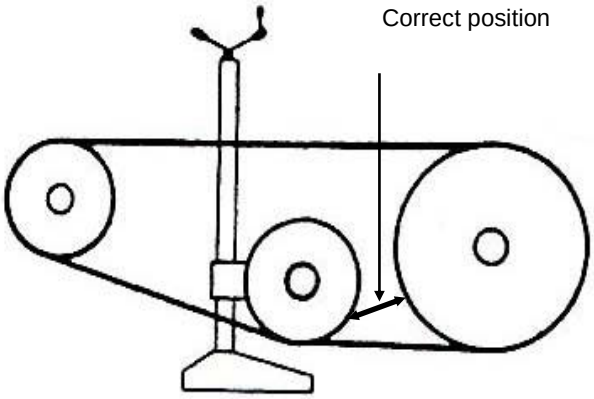


FIG 11b.

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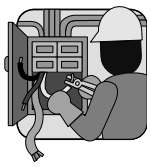


PRACTICE

Follow the procedure described to tension the V-belts of the given belt drive.

Ask your Training Officer to check your work and if it is correct, to sign below and then go on to the next section.

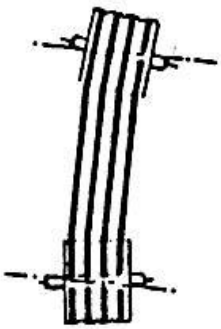
LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

4. ALIGN PULLEYS

ITEM / TASK: Introduction.

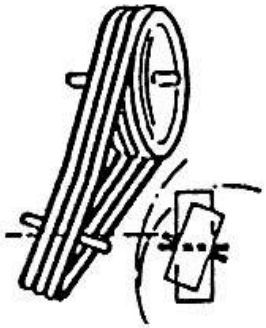
DESCRIPTION:

A. Good alignment of pulleys is vital. If not properly aligned, the V-belt flanks will wear quickly. Figs 12a, 12b and 13a show examples of poor alignment. Fig 13b shows correctly aligned pulleys.



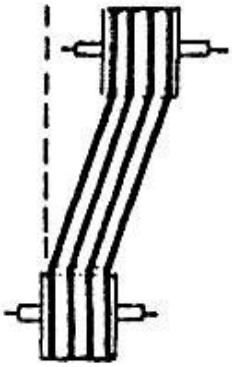
Shafts are not aligned

FIG 12a.



Shafts are parallel but not in line

FIG 12b.



Shafts are parallel but pulleys are not aligned

FIG 13a.

Correct

FIG 13b.

ITEM / TASK: Prepare V-pulleys for lining up.

DESCRIPTION:

A. Remove the rocking of the motor on the base plate.

B. Measure the distance from the front face to the first groove on both V-pulleys. Call it “X”. (Fig 14)

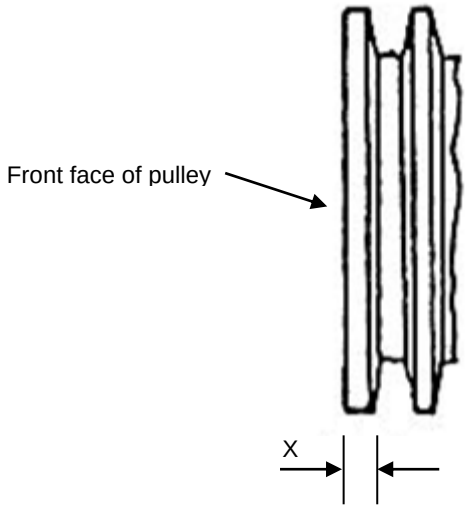
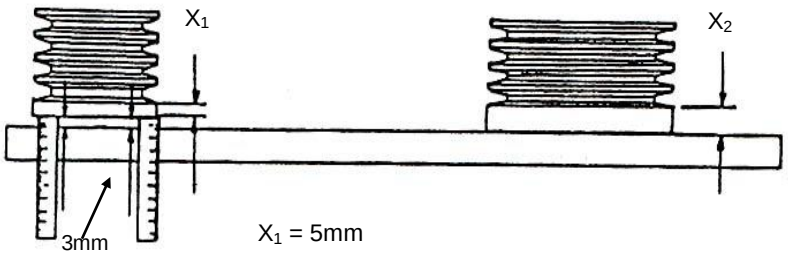


FIG 14.

- **If “X” is the same for both pulleys :**
  - Slacken the clamping bolts.
  - Take up the tension of the V-belts with the tension screws.

- **If “X” differs on the pulleys.**
  - When there is a difference in the dimension “X”, allowance must be made to compensate for the difference in size from the outside face to the first groove, e.g. In Fig 15, X_1 = 5mm and X_2 = 8mm, i.e. there is a difference in X of 3mm.



X_1 = 5mm

X_2 = 8mm

5mm + 3mm = 8mm = X_2

FIG 15.

Proceed as follows to allow for the difference: (Fig 14)

- Hold the straight edge flat and square against the face of one pulley.
- Move the motor by tapping it with a soft hammer until you can measure 3mm between the face of the pulley and the straight edge on both sides of the pulley.

C. Ensure that the vertical angle of the motor pulley is the same as the driven pulley or fixed pulley. If not, rectify it by using one of the following methods:

Use a plumb line:

- Hang the plumb line against the fixed pulley and check how big the gap is, if any.
- Move the plumb line to the pulley on the motor and do the same.
- Packing can now be placed under the base of the motor, in the front or back until the gap on both pulleys is the same.

Use the protractor of a combination set.

- Place the protractor's flat side against the driven pulley and get the bubble to be in the middle of the glass.
- Lock the protractor in this position and move it to the driving pulley.
- Packing can now be placed under the base until this pulley is at the same angle as the other one.

ITEM / TASK: Use a straight edge to line up V-pulleys.

DESCRIPTION:

A. First check the ***run-out*** of the pulleys.

The wobble of the pulleys must be checked with a dial test indicator. (Fig 16) The run - out must be within the limits of ± 0.1mm.

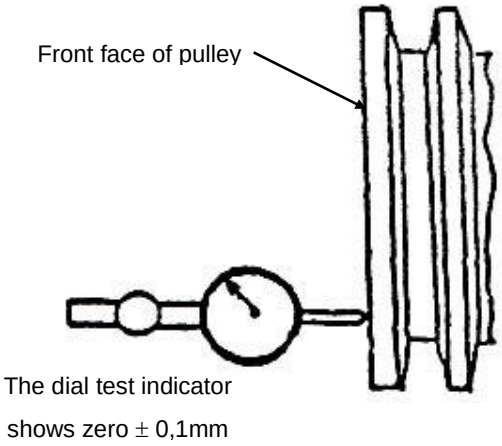


FIG 16.

B. Now line up the pulleys as follows.

- Place the straight edge flat against the front face of the fixed pulley and as close as possible to the centre of the pulleys. (Fig 17)

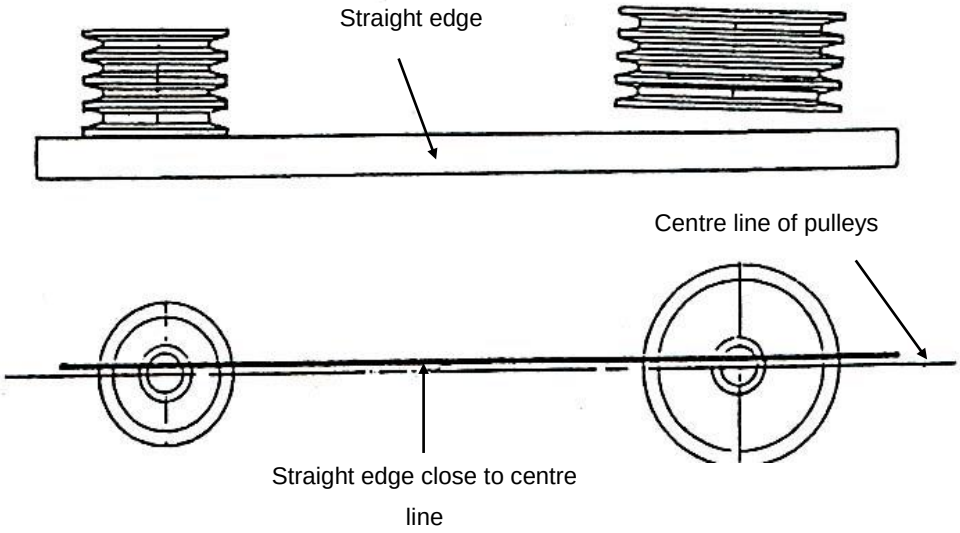
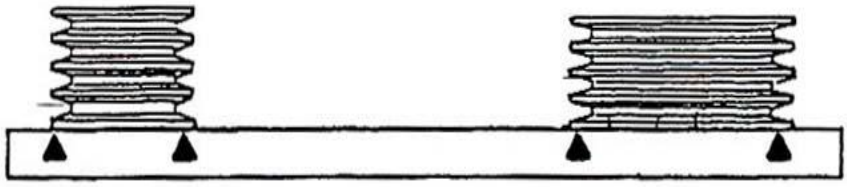


FIG 17.

- Move the other pulley by tapping it with a soft hammer. Make sure that all edges of both pulleys touch the straight edge. (Fig 18)

NB:

If a 0,05mm feeler gauge is inserted between the straight edge and each of the pulleys, it must not be possible to slide it over the face of the pulley for more than 25% of the diameter of the pulley.



All four edges touch the straight edge

FIG 18.

ITEM / TASK: Use a piece of string to line up V-pulleys.

DESCRIPTION:

A. Hold one end of the string or line against the edge of one of the pulleys. (Fig 19)

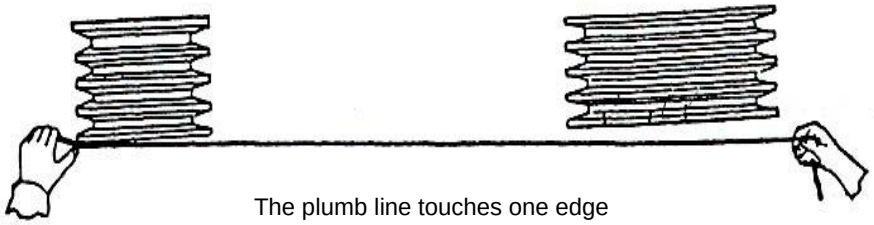


FIG 19.

B. Slowly move the other end towards the drive until the line touches another edge of any of the pulleys. (Fig 20)

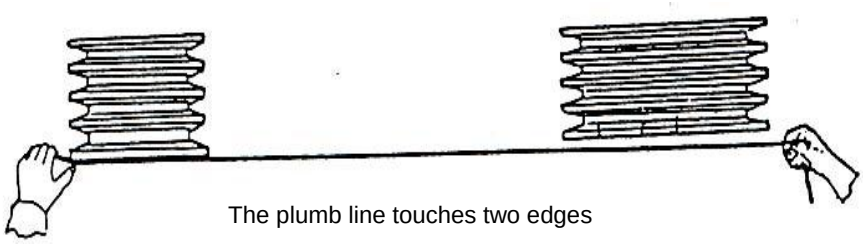


FIG 20.

C. Move the other pulley until all four edges touch the string. (Fig 21)

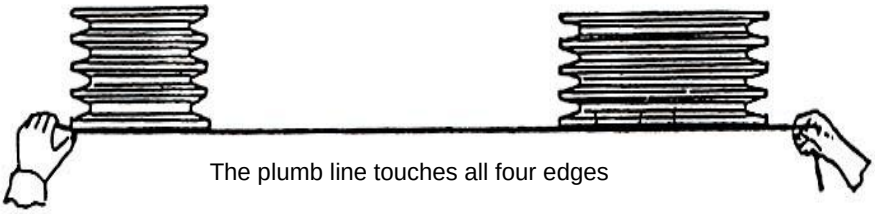


FIG 21.

NB:

It is not possible to measure the tolerance when a string is used to do the alignment.

5. INSTALL BELTS ON A V-BELT DRIVE

ITEM / TASK: Remove V-belts and inspect pulleys for wear.

DESCRIPTION:

A. Switch off and lock out all power to the drive and put a warning notice on the main switch: "Men at Work. Do not switch on".
B. Ensure the drive is stationary.
C. Remove the safety guard.
D. Loosen the clamping bolts.
E. Slacken off tension adjustment screws completely and remove the V-belts.
F. Inspect the sheaves to make sure that they are clean and free of nicks / chips or burrs.
G. Measure the grooves of the pulleys for wear with a v-pulley gauge (Fig 22):

- Select a suitable gauge by measuring the pitch circle diameter of each pulley and determining the section of the belts.

  For a pulley with a pitch circle diameter of 80mm and grooves to take 13 x 8A V-belts, a 13 x 8 gauge must be selected. This gauge has 3 options on it. (Fig 23)

  a. One with an angle of 38º for pulleys with a pitch circle diameter (PCD) more than 135mm.
  b. One with an angle of 34º for pulley with a PCD between 66mm to 135mm.
  c. One with an angle of 30º for pulleys with a PCD of less than 66mm.

  Therefore, for a pitch of 80mm the gauge with the 34º angle must be used.

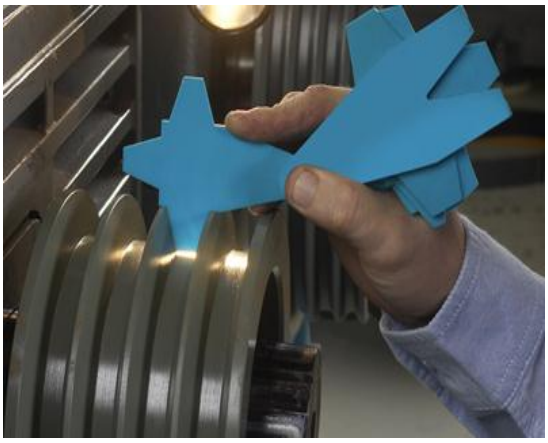


FIG 22.

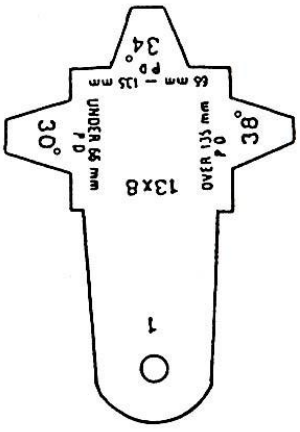


FIG 23.

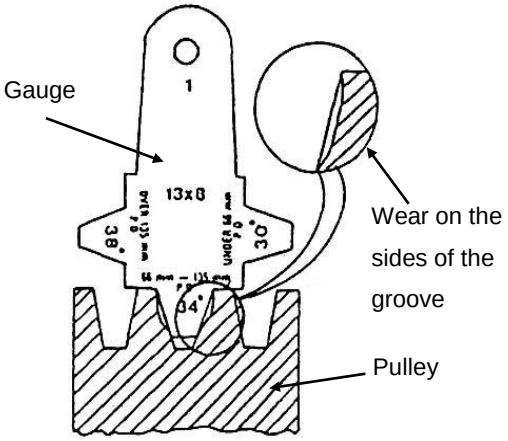


FIG 24.

- Fit the gauge into the groove, measure the wear between the gauge and the groove with a feeler gauge. (Fig 24 on previous page)
- Replace a pulley block if the wear on one or more of the grooves exceeds 0.75mm.

ITEM / TASK: Install V-belts.

DESCRIPTION:

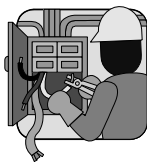
A. Make sure the correct V-belt is selected for the pulley. If more than one V-belt is used on the same drive, ensure that they are a matched set.
B. Make sure that the adjusting screws and clamping bolts are slackened fully. This enables the V-belts to be placed in the grooves without being forced.
C. Start adjusting the adjusting screws until the V-belts are snug.
D. Frequently check the pulley alignment and correct if necessary.
E. Adjust the V-belts to the correct tension and tighten the adjusting screws and locknuts.
F. Tighten the clamping bolts.
G. Replace the guard and check the following:
    - guard is not damaged or dented, and
    - guard is clear of the pulleys.
H. Restore the power supply to the drive and restart the drive.
I. Let it run for a few minutes on load. Check the tension of the V-belts and correct if necessary.

NB.

Before restarting the drive:

- **check that no tools have been left on or near the drive, and**
- **guard is replaced.**

DO THE PRACTICE ON THE NEXT PAGE BEFORE CONTINUING WITH THE REST OF THE MODULE.



PRACTICE

Practice replacing and aligning the V-belts of the drive provided, using the procedures described in the module.

Ask your Training Officer to check your work and if it is correct, to sign below and then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

5. MAINTAIN V-BELT DRIVES

ITEM / TASK: Troubleshoot and maintain V-belt drives.

DESCRIPTION:

The following are the five most important points to **check and correct** when doing maintenance on V-belt drives:

a. **Small cracks** on the base and / or sides of the V-belts are generally caused by excessive heat and chemical fumes. The heat may be generated by the belt slipping.
b. **Swelling or softening** of the V-belts is caused by excessive contamination by oil, certain cutting fluids or rubber solvent.
c. **Whipping** :
   - Whipping of *one or more V-belts* on a multi-belt drive (Fig 25) normally occurs when the V-belts are not properly matched, or one or two of the grooves are worn.
   - Whipping of *all the V-belts* is normally caused by incorrect tensioning.

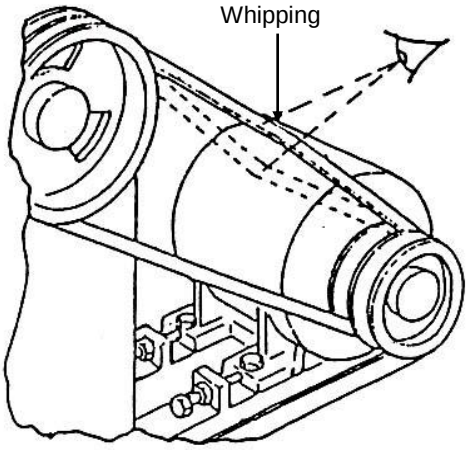


FIG 25.

d. **Frayed / worn V-belts,** which are caused by misalignment of the pulleys or the V-belts rubbing against the guard.
e. **Excessive slip** after the V-belts has been tensioned correctly. This is normally caused by excessive wear in the grooves. Use a groove gauge to check the grooves for wear.

NB.

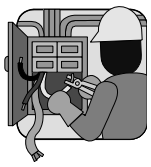
Continuous breakage of V- belts is caused when excessive wear of the pulley grooves causes the V-belt to come in contact with the inner surface of the groove.

ITEM / TASK: Storing of V-belts.

DESCRIPTION:

A. If V-belts are to be stored for a long time, it must be ensured that that the V-belts are not exposed to direct sunlight or damp conditions.
B. V-belts must not be stored in tightly rolled up bundles and placed on the floor.
C. To prevent kinks and twists in the V-belts, it must be hung over formed blocks or relatively thick pegs.

DO THE PRACTICE ON THE NEXT PAGE.



PRACTICE

Do routine checks on a different V-belt drive to the one used in the previous practice, and report your findings to your training officer.

Ask your Training Officer to check your work and if it is correct, to sign below.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

REMEMBER ALWAYS WORK SAFE

Once you have passed the entire self-tests and practices, you are now at liberty to request a Formative Assessment from your Assessor.