



ANGLAIS

FLUID COUPLING VERSUS VFDs FOR HIGH INERTIA ROTATING DRIVEN LOADS

As the adage goes, “there is more than one way to skin a cat”. In the early stages of many projects, system designers are faced with choices; whether they are designing a new application or retrofitting an old one, they need to define what is the most efficient, economical and practical way of completing the task at hand. Though there are at least two viable means to accomplish the task, the first step is

5 always to review and weigh the merits of each option. Fully understanding these options, as well as the benefits and drawbacks of each, will invariably lead to a better, more robust design. Not weighing these possibilities can lead to project delays and budget overruns.

When it comes to high inertia rotating driven loads, several factors should be addressed. Startup and slowdown behaviours are typically the primary concerns but attention must be given to the behaviour

10 of the equipment while running. Applications can vary from large conveyor systems, crushers, pumps, fans or any number of equipment types. Each application will have its own operation nuances, and this will need to be considered during the design process.

For handling the startup / slowdown and operational running dynamics of a high inertia rotating driven load, two options are commonly reviewed: fluid coupling and variable frequency drives (VFDs). Starting and stopping any high inertia load and dealing with the massive potential energies of such a system is

15 always a challenge. If you then add the potential shock loads, resonance issues or any other number of other concerns that typically accompany **this style of system**, you can see that particular attention must be paid to mitigate **these factors**. Ramp up, ramp down and dampening become of paramount importance, and controlling / protecting the prime mover is a critical design concern.

20 Both fluid coupling and VFDs have inherent benefits and drawbacks. Understanding these benefits / drawbacks as well as the application at hand will allow for choosing the most appropriate solution for a particular application.

VFDs are used for various operations and applications. They are electronic devices which are often used in place of magnetic starters. Their purpose is to start and to stop a motor as well as to control

25 its speed, speed ramp, current draw and a wealth of other control features. Fluid couplings, on the other hand, are mechanical couplings that are filled with a fluid, typically oil. It is what enables an automatic transmission vehicle to be at rest while the engine is running. Continued diligence by system designers to stay current with **these technologies** is needed to ensure that full advantage can be taken on behalf of end users of these great advancements.

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I. READING COMPREHENSION

(9 marks)

A. Circle the most adequate explanation for the adage below. **(1 mark)**

1. **“There is more than one way to skin a cat”** means: system designers agree that:
- a. possibilities are unlimited in high inertia rotating driven loads.
 - b. high inertia rotating driven loads can be tested on cats.
 - c. applications are varied when dealing with high inertia rotating driven loads.
 - d. there is one way to deal with high inertia rotating driven loads.

B. Which sentence in the first paragraph shows the real meaning of the adage? **(1 mark)**

2. -----

C. What do the words and phrases in bold in the text refer to? **(1.5 marks)**

3. **“this style of system”** (paragr. 3): -----

4. **“these factors”** (paragr. 3): -----

5. **“these technologies”** (paragr. 5): -----

D. All the statements below are **FALSE**. Find the justification for each in the text. **(1.5 marks)**

6. In the design of applications for high inertia rotating driven loads, old systems are totally eliminated.

Justification: -----

7. Applications in high inertia rotating driven loads are the same for all systems.

Justification: -----

8. Any initial action to start the engine of a vehicle will result in setting that vehicle in motion.

Justification: -----

E. Write each word under the correct category in the chart. **(2 marks)**

efficient / mitigate / slowdown / design / ramp up / retrofit / high / dampen

MOTION	CHARATERISTICS	CONSTRUCTION	CONTROL
9. -----	11. -----	13. -----	15. -----
10. -----	12. -----	14. -----	16. -----
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F. Read the text carefully and use information in the box to complete the table. (2 marks)

Box

project delays / being faced with options / define most economical way of completing tasks / better and more robust design / design a new application / budget overruns / retrofitting an old one / define most efficient way of completing tasks /

Table: STAGES IN ANY SYSTEM DESIGN

17. Basic situation which all system designers are confronted with.	a. -----
<u>Stage 1</u>	b. -----
18. Options available to system designers	c. -----
<u>Stage 2</u>	d. -----
19. Two criteria the choice is based on.	e. -----
<u>Stage 3</u>	f. -----
20. End result after option analysis	g. -----
21. Consequences if these stages are not followed.	h. -----

II. LINGUISTIC AND COMMUNICATIVE COMPETENCE (6.5 marks)

G. Rewrite the following sentences using the given prompts. (3 marks)

22. They had never applied such a sophisticated design system before.
It was the first time such -----

23. With the invention of electronic components, the costs of devices are increasing.
With the development of electronic components, the costs of devices are getting -----

24. Startup and slowdown are the major concerns in high inertia rotating driven loads, but attention must be paid to equipment behaviour while running.
Although -----

25. Both fluid couplings and VFDs have inherent benefits and drawbacks.
Fluid couplings have inherent benefits and drawbacks, so -----

H. Fill in the gaps with the correct prepositions. (1.5 marks)

WITH / IN / AROUND / AS / TO / OF / FROM /

Hydraulic fluid couplings transfer rotational force (26) ----- a transmitting axis (27)----- a receiving axis. The coupling consists (28) ----- two toroids in a sealed container. One toroid is attached to the driving shaft and spins (29) ----- a rotational force. The spinning toroid moves the rotational fluid (30) ----- the receiving toroid. Fluid coupling has been used (31) ----- an alternative to a mechanical clutch in a machine.

Epreuve du 1^{er} groupe

I. Read the information in the table below. Match **A** and **B** using the appropriate connectors to complete the sentences under the table. **(2 marks)**

A	Connectors	B
i. By changing the frequency of the current, we are able to control a motor's velocity...	thanks to	a). ...it should not be overlooked.
ii. This ability to control current using VFDs is often thought of as a second benefit, (...)	as	b). ...also controlling current.
iii. It becomes possible for operators to have an added benefit of system monitoring...	while	c). ...a speed sensor for high inertia rotating driven loads is used.
iv. The additional cost for implementation is often negligible...	but	d). ...an observer control system that offers excellent results by using algorithms.

- 32. By changing the frequency of the current, we are able to control a motor's velocity -----

- 33. This ability to control current using VFDs is often thought of as a second benefit -----

- 34. It becomes possible for operators to have an added benefit of system monitoring -----

- 35. The additional cost for implementation is often negligible-----

III. WRITING

(4.5 marks)

36. Choose one of the topics below and write a passage of not more than 150 words.

Topic 1:

A public transportation company has been suggested to use chain or gear systems to operate doors on their vehicles. They think pneumatic systems would be better. They do not know much about such systems and would like your advice. Write down a paragraph showing the advantages and drawbacks of pneumatic systems.

Topic 2:

Automated systems contribute to reducing mechanical effort in machines but their applications raise problems related to the cost of maintenance and use. Choose a few problems related to their use and suggest solutions.