

Dedication

To my parents, teachers and my
family

Acknowledgements

I wish to express my deepest gratitude to my supervisor, Dr. Abd Alfattah Bilal, for his support, advice and guidance throughout the course of my research.

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Abstract

Variable speed drive technology has advanced dramatically in the last 10 years with the advent of new power devices and magnetic materials. This has given rise to substantial confusion by users and specifiers of variable speed drive equipment. Add to that the difficulty in evaluating efficiency, torque and power. And this make the subject of drive selection becomes a daunting task indeed. There is no single type of drive system which is perfect for all applications. Therefore the purchaser must choose the most appropriate system for the job to be done.

In the automobile differential gear drive which consists of two side gears and two pinion gears, the function of the differential pinions gears is to compensate the decrease in the speed of the output of one of the differential side gear by increasing the speed of the other differential side gear by the same amount.

The fact above was used to constructs a variable speed drive using the differential gear mechanism. In the proposed design the speed of one of the side gear will be reduced using an electromagnetic brake in order to increase the speed of the other differential side gear, to which an output shaft is connected. The attainable torque, power and efficiencies were calculated using Microsoft Excel package.

The results of this research proved that the technical viability of using differential gears mechanism as a variable speed drive is a viable. And suitable for applications where the extended speed range was required, as in the work shop machines.



تقنية النواقل الحركية متغيرة السرعة تطورت بصورة مذهلة في العشرة سنوات الأخيرة وذلك بتطور معدات الطاقة والمواد المغناطيسية الحديثة. وهذا أدى إلى زيادة الارتباك بين المستخدمين و مختاري أنظمة النقل الحركية متغيرة السرعة. أضف إلى ذلك الصعوبات في تقييم الكفاءة والعزم والطاقة. وبهذا أصبحت عملية إختيار الناقل الحركي مهمة شاقة حقا.

ليس هناك نوع محدد من أنظمة النواقل الحركية تصلح لجميع التطبيقات، وذلك يجب علي المشتريين إختيار الأنظمة الأكثر تناسبا لأداء الوظيفة.

في نظام التروس الفرعية للسيارة تحدثوى المنظومة علي ترسين جانبيين وترسين وسيطين، الهدف من التروس الوسيطة هو تعويض فقد السرعة لأحد التروس الفرعية الجانبية بإضافتها إلي الترس الفرعي الجانبي الآخر بمقدار متساوي.

إستخدمت الحديقة أعلاه لبناء ناقل حركي متغير السرعة بإستخدام تقنية التروس الفرعية. في التصميم المقترح سرعة أحد التروس الجانبية يتم إبطائها بإستخدام فرملة كهرومغناطيسية من أجل زيادة سرعة الترس الجانبي الآخر المتصل بعمود الخرج. العزم والقدرة والكفاءة المتحصل عليها تم حسابها بإستخدام برنامج Microsoft Excel وقد أكدت نتائج البحث إمكانية إستخدام التروس الفرعية كناقل حركي متغير السرعة ويتناسب مع التطبيقات الهندسية التي تتطلب مدي واسع من السرعات مثل ماكينات التشغيل.

List of symbol

AC	Alternating Current	1
DC	Direct Current	1
VSD	Variable Speed Drive	1
CNC	Computer Numerical Control	2
WP	Work Piece	6
ep	Eccentricity of the pump	25
em	Eccentricity of the hydraulic motor	25
RWD	Rear Wheel Drive	34
FWD	Front Wheel Drive	35
4WD	Four Wheel Drive	35
IRS	Internal Rear Drive Suspension	35
BPZ	Brake system Preloaded Zone	75

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