The Ron Brandt Permag Motor Technical Report

By

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This report will present detailed information on the Ron Brandt Permag Motor. The controller and motor are integrated into a system that provides motive power at very high efficiency. The method and apparatus for this device may be found to be sufficiently inventive to warrant one or more patents. In this report, I will try to show those points of interest I feel should be examined for patent applications.

Here is the data acquired while working with Ron to document his invention.

1. Description of device and test results - 4 pages

   A. Field test report, results and recommendations
   B. Motor and controller operation theory
   C. Possible patent claims
   D. Product development procedures

2. Electronic controller diagrams - 18 pages

   A. Controller photographs - 2 pages
   B. Controller electronic diagrams - 5 pages
   C. Controller component information - 5 pages
   D. Prototype controller circuit board designs - 5 pages

3. Motor design drawings and machining details - 14 pages

   A. Prototype 10 HP motor photos - 3 pages
   B. Existing prototype CAD design drawings - 11 pages
   C. Motor test report from 1/5/1996

Section 1A. Field test report, results, and recommendations

This is test information derived from on-site data done in Ron's lab on 1/5/96. The tests were done with some previously run test data done by Ron Brandt that I can not verify, but have every reason to believe was represented accurately to me by Ron Brandt.

This information was the base load test of a 5 HP 1 PH AC motor tied to the 37 kW Kato generator. The motor consumed 29 amps at 110 VAC to run the Kato generator used as a test dynamometer. This equates to 3400 watts using the calculation of amps x volts, and 4.55 HP, using the formula 3400 watts/746 watts for horse power. Ron stated that the AC motor could only run the generator for a few minutes, it then overheated and shut down on thermal overload.

This is the real time test data that we recorded on 1/5/96. More tests are required and recommended as the conditions were not ideal and only give us limited information that indicates that this motor does operate at a very high efficiency level. Exact data done in the best conditions in a certified dyno test facility would be highly recommended. Motor testing should include those power ranges desired in the final design to produce a motor for use in an electric vehicle.

Ron's 10 HP motor is belt coupled to the 37 kW Kato generator. The generator was designed to be powered by a 60 HP diesel engine.

We will assume a 3400 watt load to run the Kato based on the previous test run by Ron Brandt. If Ron's motor can run the generator with less total watts of power, we can assume we have higher comparative efficiency than the conventional motor. The magnitude of difference is an indicator to gauge the relative efficiency under the specific test conditions.

The Permag motor Ron has invented has the ability to produce the same motive force to the Kato generator with an average of 1661 watts of input power. When this is compared to the standard AC 5 HP motor consuming 3400 watts, the Permag motor produced much more horse power per watt of energy consumed, indicating higher efficiency.

The test results:

Kato base load 5 HP 110 VAC motor	3400 Watts
Permag motor running same test load	1661 Watts
Relative efficiency = 3400 / 1661 average of 2 test groups	**204 %**

The Permag motor produced 4.55 HP to the load with 1661 watts of power.
1661 watts / 746 watts per HP = 2.22 Horse power of electricity.

The standard motor required 3400 watts / 746 watts per HP = 4.55 HP to operate the same load. The Permag motor was more efficient under these test and load conditions.

Section 1B. Motor and controller operation theory

This device consists of 2 major components: the motor and the controller. The motor uses new and inventive construction techniques that decrease the amount of power required to put a magnetic field in the stator. The motor construction creates more magnetic flux at the motor magnet junction in the rotor, creating more useable motive force. The effect is derived from the use of M19, M20, or M21 silicon steel in the construction of the stator plates. Most motors use M6 or soft iron, creating a greater quantity of magnetic and thermal loss. The silicon steel used in the Permag motor allows us to put a magnetic field into the stator with much lower losses due to heat and magnetic effects. The rotor magnets are propelled by the stator's rotating magnetic field, generating motive power at very high efficiency.

The function of the controller

1. To create the rotating magnetic field in the stator timed by electronic 3 latching hall effect sensors in the motor stator spaced at 120 degrees.

2. To recover much of the back EMF from the stator coils to be recycled into the motive process again. This improves the motor's efficiency.

3. To protect the motor and drive system from faults that can damage the motor or the controller.

4. To provide speed, torque, forward, reverse, throttle, and cruise control functions to control motor operation.

Section 1C. Possible patent claims

The motor has been field tested and found to perform well under the test conditions as noted. There are several possible patent claims that will have to be investigated for validity and checked for any infringement against other motors and controllers of this type. These are the points of interest I see from working with Ron and from documenting his work.

1. The system could be patented as a system for generating high efficiency mechanical force from electromotive force. This patent would include the motor and controller. It would include all information in the current prototype.

2. Patent the motor design in the 10 and 50 HP configurations. This method would protect the machining information for the motor design. The current environment indicates that we may lose date of origination due to work currently being done in Japan and other locations in the U.S., Canada and Europe. Ron Brandt's motor design will not change substantially. The few changes required would not likely warrant any delay in patent proceedings for the current motor design. The system controller would have to be redesigned, requiring additions to this patent for the improved controller design for automotive use.

3. Patent individual elements of the design if any problems occur in options 1 or 2

   a. The back EMF recovery system and snubber circuit design may be a valid claim. The recovered power is recycled back to the motor to generate increased efficiency.

   b. The use of special materials to build a motor of high efficiency.

   c. The use of a drum type rotor to allow high speed operation with low risk of magnet bond breakdown resulting in dangerous fragments being ejected from the motor.

   d. The controlled drive circuits are unique and establish a possible claim for a method of high speed switching for inductive motor loads.

Section 1D. Product development procedures

1. Build and test a 50 HP prototype for use in the silvervolt electric vehicle. This includes a 50 HP prototype and the updated controller. Run a full set of track and dynamometer tests to see if we have achieved target goals of range, speed, power, endurance, and quality. Validate and document all design changes. Verify cost estimates, parts availability and delivery times for components based on projected production schedule.

2. Update changes to motor patents when the prototype silvervolt configuration is functional. Make a public disclosure to prevent suppression of patent under military use clause.

3. Production planning and cost control phase begins when patents are established and no litigation would be likely. The project will then enter into the manufacturing stage. This should involve the inventor, Ron Brandt, to make sure that all the tooling, components, and design can be replicated in mass production environments.

PERMAG MOTOR TESTS 1/5/96

BY
RON BRANDT
HANS BECKER

Ron's 10 HP 10 lb. motor was belt coupled to a 37 kW Kato generator. This generator was originally operated by a 60 HP diesel engine. A 5 HP 1 PH 117 Vac motor was tested to get a minimum base test on the Kato for reference.

A 5 HP motor running Kato in excited mode with no load.

Input power readings:

Amps 29.00 volts 117 Vac RPM 1800 power used 3393 watts 4.54 HP.
Motor over heated and shut down after a few minutes of run time.

Ron's Permag motor was connected to the Kato 37 kW generator.

Test 1	Input volts	Input amps x 4	HP	Watts
Kato free run	98.7	2.53	1.31	980
Kato excited	93.0	4.60	2.29	1711
Kato excited 100 w/load	92.5	4.8	2.38	1776

Increased battery supply to Permag motor and controller by 12 VDC

Test 2	Input volts	Input amps x 4	HP	Watts
Kato free run	108	2.67	1.55	1153
Kato excited	106	3.8	2.15	1611
Kato excited 100 w/load	105	4.0	2.25	1680
Kato excited 200 w/load	105	4.25	2.39	1785

Assume base load of 5 HP to run Kato 3400 watts with conventional motor.

Motor efficiency %

Kato Base Load	Permag Motor	5 HP AC motor 1 PH 117 VAC
3400 watts	1661 watts (avg. of 2 tests)	3400 watts-overheated motor

Based on this test, the Permag motor produced 204% more power per watt than a conventional electric motor.

Based on this test, a 50 HP design would produce:

200 VDC at 200 amps input, 40 kW maximum input

conventional motor 50 HP	Permag motor 50 HP
output 53.6 HP	output 160 HP

PREMAG MOTOR TESTS 1/5/1995

BY RON BRANDT
HANS BECKER

RONS 10 HP 10 LB MOTOR WAS BELT COUPLED TO A 37KW KATO GENERATOR. THIS GENERATOR WAS ORIGINALY OPERATED BY A 60 HP DIESEL ENGINE. A 5 HP 1 PH 117 VAC MOTOR WAS TESTED TO GET A MINIMUM BASE TEST ON THE KATO FOR REFERENCE.

5 HP MOTOR RUNNING KATO IN EXCITED MODE WITH NO LOAD.

INPUT POWER READINGS.

AMPS 29.00 VOLTS 117 VAC RPM 1800 MOTOR 3393 WATTS 4.54 HP. MOTOR OVER HEATED AND SHUT DOWN AFTER A FEW MIN. OF RUN TIME.

RONS PERMAG MOTOR WAS CONNECTED TO THE KATO 37 KW GENERATOR.

TEST 1	INPUT VOLTS	INPUT AMPS TIMES 4	HP	WATTS
KATO FREE RUN	98.7	2.53	1.31	980
KATO EXCITED	93.0	4.60	2.29	1711
KATO EXCITED 100 W LOAD	92.5	4.8	2.38	1776

INCREASED BATTERY SUPPLY TO PERMAG MOTOR AND CONTROLER BY 12 VDC

TEST 2				
KATO FREE RUN	108	2.67	1.55	1153
KATO EXCITED	105	3.8	2.15	1611
KATO EXCITED 100 W LOAD	105	4.0	2.25	1680
KATO EXCITED 200 W LOAD	105	4.25	2.39	1785

ASSUME BASE LOAD OF 5 HP TO RUN KATO 3400 WATTS WITH CONVENTONAL MOTOR

MOTOR EFF %

KATO BASE LOAD	PERMAG MOTOR	5 HP AC MOTOR 1PH 117 VAC
3400 WATTS	1651 WATTS AVE OF 2 TESTS	3400 WATTS OVER HEATED MOTOR

BASED ON THIS TEST THE PERMAG MOTOR PRODUCED 204 % MORE POWER PER HP THAN A CONVENTONAL ELECTRIC MOTOR.

WHEN THE KATOS LOAD WAS INCREASED THE PERMAG MOTOR USED LESS WATTAGE. THAN THE OUTPUT OF THE GENERATOR TO THE LOAD IN WATTS.

BASED ON THIS TEST A 50 HP DESIGN WOULD PRODUCE!

200 VDC AT 200 AMPS INPUT. 40KW MAXIMUM INPUT.

CONV. MOTOR 50 HP	PERMAG MOTOR 50 HP
OUTPUT 53.6 HP	OUTPUT 160 HP

PERMAG MOTOR 14 INCHES DIAMITER BY 5 INCHES LONG EXCLUDING SHAFTS AND CONTROLER.
WEIGHT WOULD IS ESTIMATED AT 1 LB PER HP FOR THE PERMAG MOTOR.