Project Statement

Revo Stationary Bike with “Generciser” Technology

9/30/2009

Team 12
Drew Seils and Shane Tornifoglio
Project for Entrepreneurial Senior Design

Contact: Dr. John Bennett, Univ. of Connecticut,
Engineering II Building Rm. 200C
University of Connecticut
Storrs, CT 06269
Phone: (860) 486-5003
E-mail: jcbjr@engr.uconn.edu
Statement of Need:

Current stationary bike designs make it difficult for elderly users or patients recovering from hip complications to step their leg over the machine and sit on the bike. These people may also have difficulty standing up from the seated position once on the bike. Being able to use the stationary bike and utilize the zero impact workout decreases recovery time and increases the stability of the hips and knees. The adjustability of current stationary bikes is also limited for example pedals are at a fixed height, displays and grips are also fixed.

Stationary bikes also generate a great deal of power that goes unharnessed. Bikes will often use the power generated by the user to power the display board, but no further uses are implemented.

Introduction and Overview:

The project title is the Revo Stationary Bike and this machine serves two main purposes. The concept for the bike is a machine that makes it easier for disabled, elderly, or otherwise injured and recovering people to use a stationary bike. The second concept is a way for the bike to feed excess power generated by the user’s kinetic energy back into the grid via an AC outlet.

The machine will be broken down into three main units, for easier assembly, manufacturing, and customizability.

The most complex unit is the head unit, which will house the “Generciser” unit which gathers the excess energy and feeds it back into an AC outlet. The benefit of using an AC outlet is that the Revo bike does not need a dedicated circuit to transmit its power output. Dedicated circuits are currently in use by gyms utilizing patron generated power and the Revo would eliminate the need for such circuits.

The head unit will also house the pedaling mechanism and the display board. Both of these components will have height and angle adjustments which will allow the user to change their riding position depending on their personal need or preference. The pedals will have adjustable toe straps to help the user maintain firm contact with the pedals during the entire revolution. Since the machine is intended for rehabilitation purposes it should be able to operate at low revolutions per minute (RPM). Most conventional stationary bikes will pause the display board or turn off the display when RPMs drop below 30 revolutions per minute.

The display board will be powered by the rider. There will be a number of features on the display board including distance, speed, calories spent (total and per hour), output in watts (current and per hour), resistance, heart rate, and workout time. The user will be able to input height and weight measurements to get more accurate caloric readings. Another display board object will be a small track made which will show user progress around a simulated 400 meter track. The display board will also have a port for charging iPods. While the iPod is attached, an LCD screen located in the center of the simulated track will act as a larger display for the iPod. This will allow the user to watch videos and cycle through music with ease during a workout. At the base of the display board will be a water bottle holder as well as a small shelf for propping up magazines or books. Surrounding the display board will be handrails which will also house the heart rate sensors.
The second unit is the rehabilitation seat. The seat will perform two primary functions. One function will be to slide down and away from the machine to make it easier for users to reach the seat without stepping over the machine. This would prove very beneficial for users who may usually need a walker to move around. It will then slide back up into the preferred position. This will all be controlled by the user via controls on a panel under the seat that slides out when in use and is stowed away while riding. This unit will be powered by a 12 volt battery that is housed in the head unit and recharged once the user is pedaling. The seat will mimic a typical bicycle saddle however a retractable back will be available to provide support for positions in which the rider is sitting at an angle greater than 90 degrees.

The third unit is a conventional seat developed for gym and private use with no motorized support. The seat will have similar adjustability to the rehabilitation unit, allowing the user to move the seat forward, backward, and vertically. The adjustable back support could also be implemented in the conventional seat.

Realistic Constraints:

There are several factors that could prove troublesome in the design process of the Revo, the greatest of which is the current state of the economy. With the economy in such a decline there is little money to spend for personal desires and wishes. With this in mind most people do not rank fitness highest on their priority list and would rather spend their money elsewhere. However, this constraint can be combated by the integration of the “Generciser.” With enough time and use the Revo will pay for itself with the electricity it feeds back into the grid. The theoretical possibility is to actually gain value from the Revo by selling excess power back. As an added bonus, personal fitness is improved.

A second economic constraint is the production cost. The Revo must be manufactured with a low enough cost so that a profit can be made by selling it on the open market. There would be no use in making a multimillion dollar bike that no one can afford. Stationary bikes usually run from $250-$1600. The Goal is to make the Revo for under $750 of production and sell for around $1000 because it is a one of a kind with rehab and the “Generciser” technology which actually provides a profit to the consumer.

There are little to no environmental constraints. Stationary bikes are generally compact in design and typically have a slim profile. The long-term effect of the Revo is actually beneficial to the actual environment because of its “green” capabilities. Converting human kinetic energy into electricity is both profitable and environmentally friendly. The possibility of using recycling materials in production of the bike could also be a selling point.

One of the more problematic constraints could be the sustainability of the Revo. As with all gym equipment, maintenance of the machine and its components are important. Every component of the machine has a lifespan that must be considered before it needs to be replaced. This lifespan can vary depending on the amount of use and the type of environment of which the equipment is stored.

However, when sustainability is applied to the consumer market the Revo will be very sustainable. The Revo has the potential to literally change household economics while at the same time providing a positive influence on the user’s personal health. The concept has potential to be a trendy item that is a new face for the current “green revolution.”
One constraint could be managing to apply the “Generciser” technology to the Revo in such a way that it can feed AC power back into the grid efficiently. This is more of a constraint due to lack of knowledge.

A manufacturing constraint is making sure that the head unit can be fitted to use both seat units. The adjustability of the Revo is also an important factor to take into account as it is crucial for its intention as a rehabilitation device.

The biggest constraints will be dealing with health and safety. The Revo will be used for rehabilitation and its primary purpose is to help patients and users recover faster and stronger than if they had no or limited exposure to exercise. A good example is a patient using the Revo who is recovering from a total hip replacement and they are injured getting on the Revo, the entire purpose of the machine is defeated. Making the device as safe as possible is of utmost importance. Once the safety of the user is assured then the health benefits may be reaped by the user of the Revo.

Other Data:

The unique aspect of the Revo with the “Generciser” technology is that it is a hybrid of different technologies. The Revo will be the only type of rehab bike of its kind with a separate attachment for personal fitness not rehab. The “Generciser” technology makes the Revo a profitable purchase for gyms and private consumers. It also provides a green solution for the environmentally conscious. The intellectual property of the Revo belongs to the student group, while the “Generciser” technology belongs to Dr. Eric Knight.

This project is part of the Entrepreneurial Senior Design Program, which ultimately has the goal of aiding students in developing a business based around their senior design prototype. The consumer market for the Revo will be three separate targets. The first client would be the nursing homes and training facilities for the elderly and those who are disabled or in rehabilitation. For large scale businesses or gyms the Revo can generate electricity, feeding it back into the grid, benefitting the gym or company. The final consumer is the average household. The concept of working out while at the same time, lowering one’s electric bill and generating green power could change the way the world looks at exercising and fitness.

Operational Specifications:

The Revo’s primary function is a stationary bike that can also be used for rehabilitation. Therefore the two interchangeable rear units that will serve as seats must be able to hold the weight of the user and have adjustable seat height. In the case of the rehabilitation attachment the motorized unit must also be able to move the user forward to the head unit to begin the workout. The motorized unit must also be able to assist the patient by rising up and helping them sit or stand before and after the exercise. The motorized unit will be battery powered and the battery will be recharged by the electricity from the “Generciser” power unit.

The user interface contains numerous different displays. These displays include a track to simulate where the user would be if they were traveling on a 400 meter track, a digital display of the total distance traveled with options for both kilometers and miles. The speed the user is traveling will be displayed in rotations per minute, miles per hour, or kilometers per hour depending on user preferences. Some other digital displays include
the total workout time in minutes and seconds, the energy output in watts, total calories
burned, and calories per hour. The resistance level will be another display that has an
option to change the level of difficulty. A display for the heart rate is the final display that
will only be activated when the hand heart rate sensors are detecting signals.

The user interface must also be programmed to allow the user to input their
personal information such as weight and height which will make figures such as calories
per hour more accurate. The software must have several different preset programs for the
user to pick from such as manual, constant heart rate, hills, one big hill, warm-up, cool
down, and quick start. The user interface will also have a larger screen display which will
display the user’s ipod screen once connected. This will allow for easier music selection
and a larger screen for viewing movies. There are also two cup holders for water bottles
and general storage. Two small shelves will aid the user by providing places to rest
magazines and books while they are exercising. The handrails will contain the hand
sensors that will activate the display to show the user’s heart rate and give them several
options for holding the head unit.

The user interface will be powered by the user’s kinetic energy. The remaining
energy will be converted to electrical AC power using the “Generciser” technology and
fed back into the energy grid via an AC outlet.

checkups annually