Roller coasters

Business, Industries

The main energy transfers that happens as a " car" travels along the track from the start of the ride to the end. 1. The main energy transfers are between gravitational potential energy (GPE) and kinetic energy (KE), and the eventual decrease of mechanical energy as it transforms into thermal energy. Roller coasters often start as a chain and motor exercises a force on the car to lift it up to the top of a very tall hill.

At this height, GPE is at its highest, as we can see through the formula: GPE = mass x gravitational field strength x height (for all physics in relation to Earth, take g to be 10 m/s2 or 10 N/kg) We can see through this formula that as the height increases, so does the GPE, which will then be converted into KE, or kinetic energy. This is the energy that takes place as the " car" is falling down the hill. This is calculated through the formula: KE = 0. 5 x mass x speed This means that the kinetic energy increases as the speed increases, and vice versa. Therefore, this means the higher the kinetic energy, the faster the " car".

We can actually be extremely specific in terms of this relationship. We know that as the mass doubles, the KE doubles, but as the speed doubles, the KE quadruples. This becomes important when analysing this formula: KE = GPE/0. 5mv2 = mgh 2. A roller coaster ride is a thrilling experience which involves a wealth of physics. Part of the physics of a roller coaster is the physics of work and energy. The ride often begins as a chain and motor (or other mechanical device) exerts a force on the train of cars to lift the train to the top of a vary tall hill.

Once the cars are lifted to the top of the hill, gravity takes over and the remainder of the ride is an experience in energy transformation. At the top of the hill, the cars possess a large quantity of potential energy. Potential energy - the energy of vertical position - is dependent upon the mass of the object and the height of the object. The car's large quantity of potential energy is due to the fact that they are elevated to a large height above the ground. As the cars descend the first drop they lose much of this potential energy in accord with their loss of height.

The cars subsequently gain kinetic energy. Kinetic energy - the energy of motion - is dependent upon the mass of the object and the speed of the object. The train of coaster cars speeds up as they lose height. Thus, their original potential energy (due to their large height) is transformed into kinetic energy (revealed by their high speeds). As the ride continues, the train of cars are continuously losing and gaining height. Each gain in height corresponds to the loss of speed as kinetic energy (due to speed) is transformed into potential energy (due to height).

Each loss in height corresponds to a gain of speed as potential energy (due to height) is transformed into kinetic energy (due to speed). Additional notes: GPE = m x g x h KE = m x v? The main energy transfers that happen as a car travels along the track from the start of the ride to the end: 3. The roller coaster car gains gravitational potential energy (GPE) as it travels to the top. Once over the top, the car gains speed as GPE is transferred to kinetic energy (KE). As it travels to the top of another loop, KE is transferred to GPE.

Not all the energy is transferred to or from GPE – some is transferred to the surroundings as heat and sound. All moving objects have kinetic energy, KE. The kinetic energy an object has depends on the mass and speed. If the mass doubles, the KE doubles and if the speed doubles, the KE quadruples. Normally energy is lost through sound and heat (friction, air resistance).

How the HEIGHTS of the hills are designed to allow an empty “ car” to reach the end of the ride. 1. The purpose of the coaster's initial ascent is to build up a sort of reservoir of potential energy. The concept of potential energy, often referred to as energy of position, is very simple: As the coaster gets higher in the air, gravity can pull it down a greater distance. You experience this phenomenon all the time -- think about driving your car, riding your bike or pulling your sled to the top of a big hill. The potential energy you build going up the hill can be released as kinetic energy -- the energy of motion that takes you down the hill.

Once you start cruising down that first hill, gravity takes over and all the built-up potential energy changes to kinetic energy. Gravity applies a constant downward force on the cars. 2. The hills are designed so that it is low enough that the momentum of the car from the previous drop carries it up and over the hill. This is why the hills are usually lower towards the end of the ride, because the car has lost momentum due to friction and air resistance. Mainly the consecutive hill must be lower as it will not have enough energy because some of it is lost and sound and heat.

Therefore, if the car was to reach the end of the ride, the height of the hills must be lower each consecutive time.

How the ENERGY TRANSFERS determines the heights of the hills. The roller coaster train, having travelled down the first drop, now has a load of Kinetic Energy. There are a number of situations that could then take place.

Situation 1: Flat Straight Track What a boring roller coaster this would make, but it illustrates a point.

If the track after the first drop was completely flat and straight... then the Kinetic Energy would, theoretically, allow the train to continue moving forever, as energy does not disapear. In the real world, however, air resistance and friction between the wheels and the track cause the kinetic energy to be converted away, and thus eventually the train will stop.

Situation 2: A Hill of Equal Height to the First Drop Another dull coaster, but this one would make the news as it is destined to get stuck. As the train speeds down the first drop, bottoms out and rises up the second hill, the train would roll back.

Even though, theoretically, the train has the kinetic energy to get up the same size hill as the first drop, much of this will be lost due to friction and air resistance. As a result, the train would only make it about 3/4 of the way up the second hill before it rolls back down.

Situation 3: A Hill of Less Height than the First Drop Now the train will have enough energy to get over the second hill, provided the hill is low enough to take into account the train style and weight, and continue onwards.

References

1. http://www. coasterforce. com/coasters/technical-info/physics-of-a-coaster
2. http://science. howstuffworks. com/engineering/structural/roller-coaster3. htm

3. http://www. studymode. com/essays/Physics-Roller-Coasters-1535452. html
4. http://www. antiessays. com/free-essays/339200. html
5. http://www. physicsclassroom. com/mmedia/energy/ce. cfm
6. http://www. studymode. com/essays/Physics-Roller-Coasters-1535452. html