Accumulator energy wikipedia

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Examples of accumulators include steam accumulators, mainsprings, flywheel energy storage, hydraulic accumulators, rechargeable batteries, capacitors, inductors, compensated pulsed alternators (compulsators), and pumped-storage hydroelectric plants.

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A hydraulic accumulator is a pressure storage reservoir in which an incompressible hydraulic fluid is held under pressure that is applied by an external source of mechanical energy. The external source can be an engine, a spring, a raised weight, or a compressed gas.[note 1] An accumulator enables a hydraulic system to cope with extremes of demand using a less powerful pump, to respond more quickly to a temporary demand, and to smooth out pulsations. It is a type of energy storage device.

The first accumulators for William Armstrong"s hydraulic dock machinery were simple raised water towers. Water was pumped to a tank at the top of these towers by steam pumps. When dock machinery required hydraulic power, the hydrostatic head of the water"s height above ground provided the necessary pressure.

Other surviving towers include one adjacent to East Float in Birkenhead, England, and another located at the Bramley-Moore Dock, Liverpool, England. The latter tower is to be renovated as part of plans for the proposed development of the area associated with the construction of a new football stadium for Everton F.C.

A raised weight accumulator consists of a vertical cylinder containing fluid connected to the hydraulic line. The cylinder is closed by a piston on which a series of weights are placed that exert a downward force on the piston and thereby pressurizes the fluid in the cylinder. In contrast to compressed gas and spring accumulators, this type delivers a nearly constant pressure, regardless of the volume of fluid in the cylinder, until it is empty. (The pressure will decline somewhat as the cylinder is emptied due to the decline in weight of the remaining fluid.)

The original operating mechanism of Tower Bridge, London, also used this type of accumulator. Although no longer in use, two of the six accumulators may still be seen in situ in the bridge"s museum.[3]

London had an extensive public hydraulic power system from the mid-nineteenth century finally closing in the

1970s with 5 hydraulic power stations, operated by the London Hydraulic Power Company. Railway goods yards and docks often had their own separate system.[citation needed]

Such accumulators typically do not have enough capacity to be useful for storing significant power since they cannot be pre-charged with high pressure gas, but they can act as a buffer to absorb fluctuations in pressure. They are used to smooth out the delivery from piston pumps. Another use is as a shock absorber to damp out water hammer; this application is an integral part of most ram pumps. Loss of air will result in loss of effectiveness. If air is lost over time, the design must include some way to replenish the accumulator.

A spring type accumulator is similar in operation to the gas-charged accumulator above, except that a heavy spring (or springs) is used to provide the compressive force. According to Hooke"s law the magnitude of the force exerted by a spring is linearly proportional to its change of length. Therefore, as the spring compresses, the force it exerts on the fluid is increased linearly.