Finding Muri (overburden) in your Process

Muri, or overburden, means that operators or machines are pushed through their natural limits, which leads to problems. The quality of the output suffers because of the state of the machine or person performing the output is in, which means muri leads to muda.

One example is the overheating the battery of an old car which leads to breakdowns (=defects), or using heavy software on your personal computer that does not have the memory power to do calculations quickly, which leads to waiting time.

In terms of human muri, being stressed can lead to you wanting to do something really quickly, which usually leads to more defects. Or even worse, you get overburdened and cannot work at all for a while.

Not only does muri lead to defects, it also leads to longer waiting times. Queuing theory shows us that the lead time of a process increases exponentially when the utilization degree increases. The lead time doubles when the utilisation of a process increases from 80% to 90%, and doubles again when it increases from 90% to 95% .

Lead time is the one measure that reduces all three aspects of the iron triangle: cost, delivery and quality, it is wise to prevent the utilization degree of your processes, machines and people to exceed 80%.

In a **MACHINE ENVIRONMENT**, muri is depending on machine performance and machine performance can best be measured by Overall Equipment Effectiveness (OEE) of the machine.

The OEE includes measures for availability, performance and quality, with the goal to prevent the machine from breaking down.

Machine related muri can be minimized by maintaining all machines as effectively and efficiently as possible. To improve the OEE of a machine and prevent muri, both preventative- and autonomous maintenance can be used.

Preventative Maintenance means a machine should be kept in operating condition by means of inspection, detection and prevention of failures. By maintaining the good shape of the machine, break-downs can be prevented which would otherwise lead to defects or even worse: accidents. The underlying thought here is that preventative maintenance is cheaper than waiting for the machine to break down and having to fix it. Preventative maintenance does not only reduce machine muri, it also reduces mura for the technical staff because the number of unplanned jobs they receive decreases, while the number of planned maintenance jobs increases.

Autonomous Maintenance is the next step after preventative maintenance and means that operators routinely perform key maintenance task on a machine, that traditionally has been done only by the best few individuals. The underlying thought is that operators work with the machines all day, so they notice abnormalities instantly. Next to that, they (again) reduce the workload of technical staff.

Our car check-up might be too complicated for most of us, but to keep the chain of your bike lubricated and the tires hard, are examples of autonomous maintenance in which the owner himself can prevent breakdowns at a latter stage.

Whether or not it is cost efficient to have a preventative (or autonomous) maintenance program on a machine can be calculated by comparing the costs of breakdowns (number per year x coast per repair x costs of lost production) with the costs of inspection (cost of activity x number of inspections per year) (Wireman, 1992).

In the **HUMAN ENVIRONMENT**, muri can be identified with the lagging indicator **employee absenteeism**. In the 21st century, more and more people end up at home with a burnout, which means they are literally overburdened up to a point where they cannot perform anymore for a period up to six whole months.

When machines or people are overloaded, more mistakes are made that could lead to defects, but muri can also result from removing too much muda (waste) from the process. When a buffer of inventory (muda) is removed without changing the actual reason why the inventory is there in the first place, chances are, inventory is there to buffer for unevenness (mura) to prevent overburden (muri). The link between mura, muri and muda is complex PEAQ solutions can help you to map and understand these causes and support change.