Reliability 4.0 Revolution: Automatic Reliability Database as part of asset management process.

One of the big challenges in the reliability and maintenance program as well as asset management is to have the reliable reliability database based on the physical asset historical data that enable leaders to take decision in real time.

In las decades, the process industry such as Oil and Gas and Chemical has been using generic reliability database as input to their reliability and maintenance as well as safety study such as OREDA, AIChE and others.

Despite a very good effort to create such database, it´s necessary to consider the one of the mains aspects that affect the reliability prediction is the operation conditions. Therefore, since such databases consider one specific environment condition, the first limitation arises.

In fact, the ideal situation is that each organization create their own reliability database based on their own equipment failure historical data. However, that´s request an implementation of reliability program and proper reliability engineering methods and application and concepts since concepts phase that´s not happen in many cases.

In addition, during the operation phase, the proper reliability index measurement becomes very important and need to be verified and validate. Unfortunately, the wrong reliability prediction has been leading many leaders to take wrong decisions during operation phase.

The reason for the wrong reliability prediction during operation are:

- Misunderstood of the Reliability concept;
- Wrong KPI´s like MTTF and constant failure rate are used because the easy calculation;
- Lack of a proper Failure Report and Corrective Actions System (FRACAS);
- Lack of Reliability and Maintenance program implementation during concept and design phase;
- The necessity of high investment in reliability software and training to predict reliability properly,
- Heavy maintenance and operation routine and lack of time to perform proper equipment reliability analysis (Lifetime Data Analysis – Weibull Analysis).

In order to solve this problem, the reliability 4.0 revolution intends to deliver an automatic reliability database based on the online reliability prediction as part of asset management process as shows the figure 1 below:
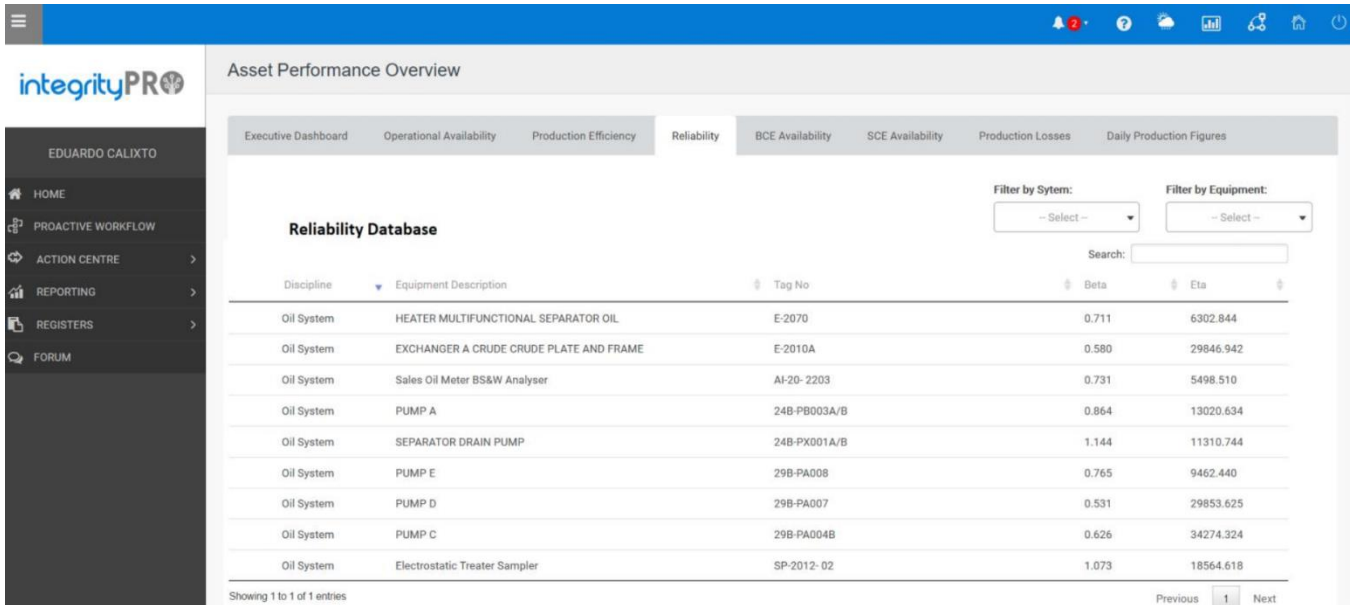
Figure 1 – Automatic Reliability Database

The reliability 4.0 enables the automatic reliability prediction based on the FRACAS database as part of Physical Asset Management process flow. Therefore, the Generic PDF such Weibull, will have the parameter predicted automatically as well as other indexes such as:

- Reliability in specific period of time;
- Equipment Operational availability;
- Next time to failure (based on Crow AMSAA Model);
- MTBF trend (based on Crow AMSAA Model);
- Failure Intensity trend (based on Crow AMSAA Model).

All such indexes are also presented with graphs automatically as shows the figures 2, 3 and 4 below:
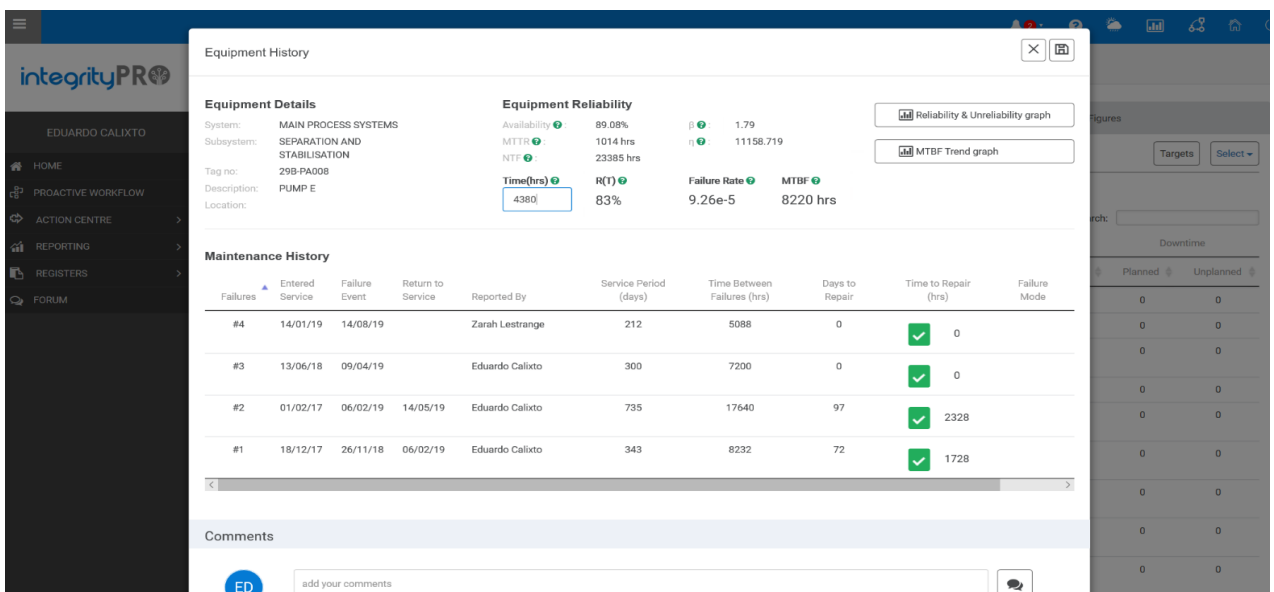

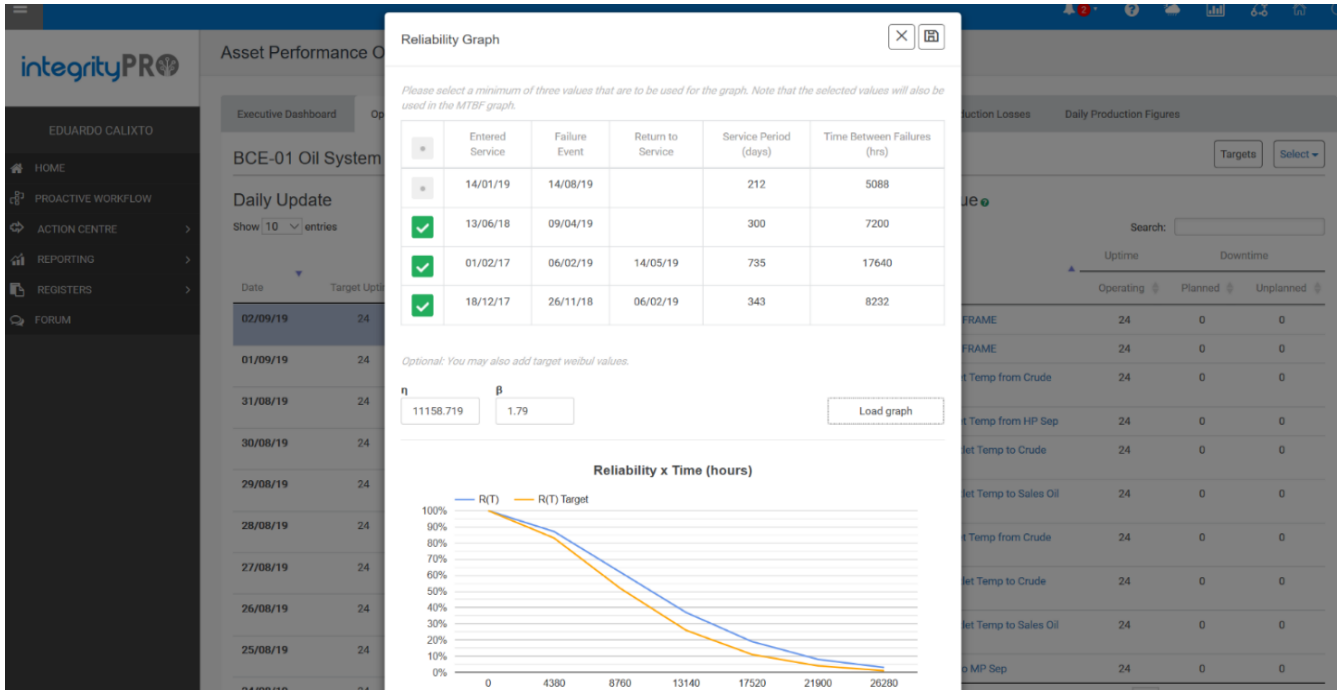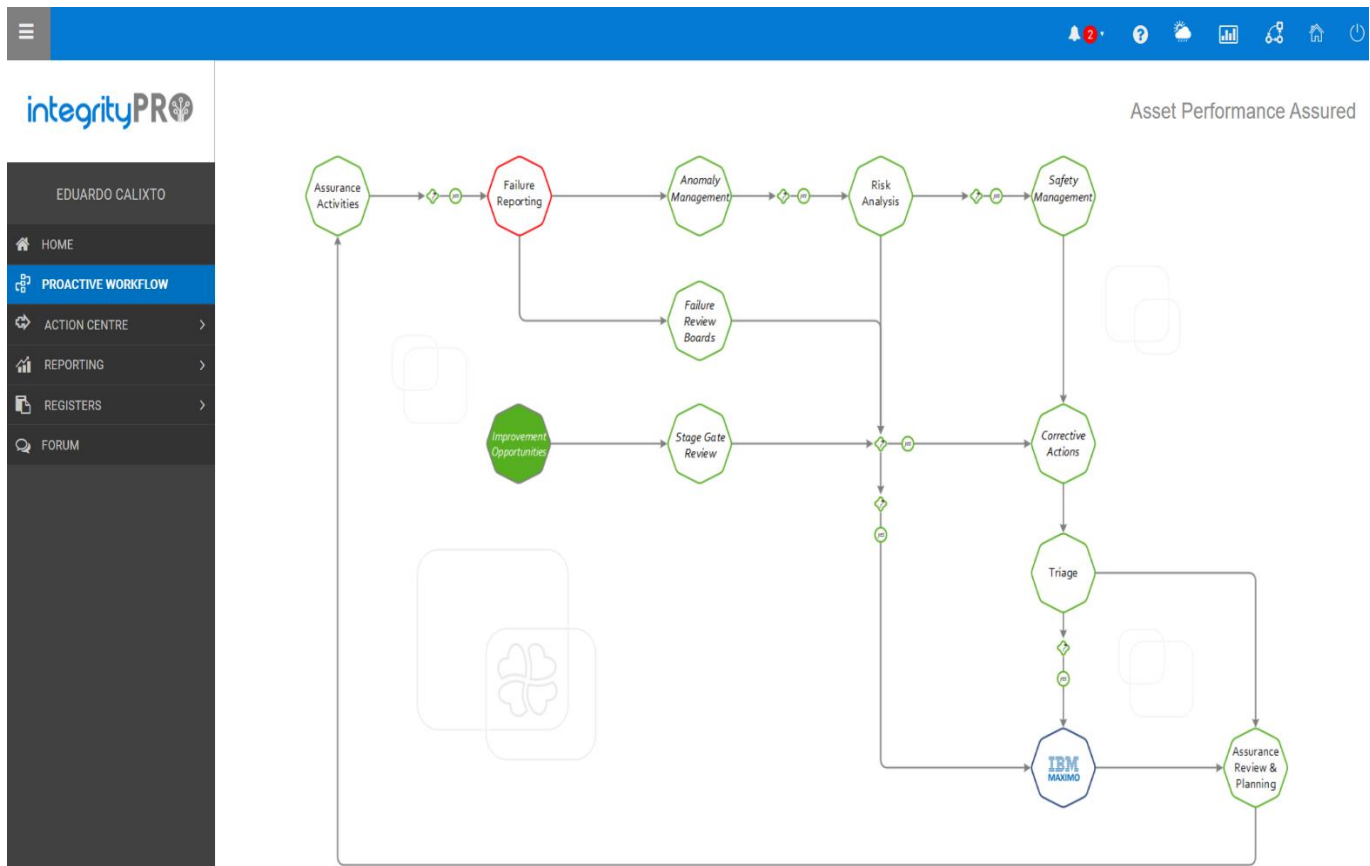Figure 2 – Reliability 4.0 prediction

Figure 3 – Reliability 4.0 graphs

Figure 4 – Reliability Growth 4.0 prediction graphs

The proposed the reliability 4.0 revolution is part of the physical asset management process that encompasses different steps such as Performance monitoring, FRACAS, Operational Risk Assessment, Safety Management (for Asset Integrity) Anomalies Management and Assurance Plan as shown the figure below:

The reliability 4.0 revolution will enable the following:

- Automatically reliability prediction.
- To have their own reliable reliability database available online in real time.
- Manager fast decision based on confident reliability indexes;
- Organization will spare time and money with reliability software and training;

Despite all such benefits, the further step in direction of Reliability 5.0 has already started. Therefore, the Reliability 5.0 will enable in a coming future to predict the equipment/component reliability based on the remaining useful life predicted based on the prognostic Health Management solutions. That will be discussed in the next paper as part of ECC technology solution.