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# DESCRIPTION OF FEATURES

## TMMonitor™ –Turbine Maintenance Management Software

Description of features
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**Contents**



**Appendices**

# 1 BASIC SOFTWARE FEATURES AND SETUP

## 1.1 Basic Software Features

The software features cover management of historic data and basic simulation of future inspections.

- Dahsboard for overall turbine view
- Turbine inspections
- Hot section part set tracking
- Service Bulletins (TILs) and activity
- GT Usage calculator
- Timeline for quick future inspections estimation
- Simulator
- Simulator Budget
- CSV basic data download to Excel

The scope of work of the program establishment comprises of the following main tasks:

## 1.2 Setup of TMMonitor™

Based on data received and report review, the program shall be established:

- Establishment of Client specific encrypted SSL secured software URL.
- Establishment of SQL software database for each GT
- Adding of data based on chapter 6.1 (In this case our assumption is that this data will be provided to GASRE organized in Excel spreadsheets, formatted per our requirements and inspection and repair reports and TILs that are preferred as individual files in pdf format.)
- Testing and commissioning
- Create user accounts and permissions

Note. Some of the program naming is standardized like operating values, table lists, table headings etc..

# 2 ANNUAL SERVICE LICENSE FEE

To be able to continue to provide this service, provide help desk and up-date the general program an annual license fee will be required. The license is based on the number of GT units the client has in the system and it covers:

- Server space, SQL database, software fees, feature fees
- SSL security
- Security reviews and frequent software security updates
- Daily system and database backups.
- Technical updates performed to the core program, which maintain system:
    - security
    - SQL data handling
    - user interface.
- Help desk

## 2.1 Help desk

GASRE will be available on normal working hours to support client with issues of the program and other technical support by email.

Hot line calls will be charged separately with hourly rates of 135€/h.

## 3 PREMIUM SOFTWARE FEATURES

Premium software includes the features of Basic software defined in chapter 2 inclusive of setup and one or both following additional features.

### 3.1 Single item feature

Our Single Item Feature makes it possible to track individual blades/buckets. This enables extremely precise tracking of set lifetime based on worst part included in the set.

- Establish templates for single items
- Establish single item status features
- Group single items
- Name single items
- Upload single items in groups
- Associate to sets
- It is expected that 4 sets (3xturbine and 1x combustor) for each gas turbine is created. All additional sets, as extra work)

### 3.2 Real time GT operational data import

Most Power plants have some type of Process Information system including current operational data from each gas turbine. To avoid entering the data manually to the usage calculator, TMMonitor™ can upload the data from a dedicated location at frequent intervals. The intervals can be pre-defined (for example once a day). Automatic update of operational data gives the end user a direct view of the capital part remaining lifetime on each gas turbine in real time and saves time as there's no need for manual input of data.

TMMonitor™ can be integrated to client's system using PIcloud™. Alternatively, if the client doesn't have an active PI-system, GASRE can install an OIM PI-system for TMMonitor™.

Alternatively TMMonitor™ has an inbuilt API, in which the client can link their own systems.

## 4 GATHERING AND LOADING DATA

### 4.1 Expected Customer obligations

The organization of each individual unit's part and operational data into a coherent and consistent format for initial entry into the TMMonitor database is a potential third cost. This cost varies based on the amount of work involved in going through reports, control systems, parts manuals, etc. to get the necessary data and convert it into a format that facilitates the TMMonitor database setup.

Below is a preliminary list of information required from the Client for the project. More information may be required depending on the information available from the reports.

- Names of Power Plant(s) and turbines
- General information of the gas turbines
- Reports in English language and in electrical format (Microsoft word, excel, power point) and/or adobe pdf (pdf preferred)
    - Inspection reports
    - Repair reports of each part
    - Service bulletins / Technical Information Letters
- List of inspections
    - Inspection name: inspections can be named freely, but it is recommended to use defined names, e.g. BI (Borescope inspection), CI (Combustion inspection), HGPI (Hot gas path inspection), MO (Major Overhaul), and indicate the year of inspection, for example, CI 2013
    - Name of the turbine to whom the inspection was performed

- Year of operation: the year in which the inspection was performed
- Inspection date: inspection's start date and end date
- Total fired hours: accumulated fired hours at the time when the inspection was performed
- Total starts and trips: accumulated starts and trips at the time when the inspection was performed
- Parts and Part Sets in/out: a list of the parts that were taken out/put in
- TILs applied
- Inspection costs

- List of parts
  - Purchase cost
  - Repair cost
  - Manufacturer
  - Location
  - Repair duration of the part
  - Current status (In Operation, Out Not Repaired, Under Repair, Repaired In Stock, New In Stock, Eon Of Lifetime, Removed from Assets).
  - If in operation, in which gas turbine.
  - Serial numbers (Individual serial numbers of the parts in a set)
  - Part number (Part number is the type defined casting number of the part)
  - Drawing number (Drawing number is the OEM definition of the type of the part that is also used when a new part is ordered, Example 110E1121G008 Rev K)
  - Client part number (Client part number can be used if the Client has different numbering system as the OEM)
  - User repair and replace intervals in Factored hours and starts
- For the Simulator Cost budgetary estimates for future inspections, the following prices for all hot section parts and inspections:
  - Average hot section part repair price
  - New procurement price
  - Inspections lump sum services prices (CI, HGPI, MO)

There may be additional information required during establishment process. GASRE will inform Client about such.

| Responsible | Kick off and definitions | Data collection | Setup | Commissioning and training |
|---|---|---|---|---|
| GASRE | Introduce TMMonitor standard naming and definitions | Review of Client provided data:<br>• Report review –parts replaced, TIL activity<br>• Inspection intervals, part replacements<br>• Number and type of parts | • Create Client specific web-URL<br>• Create initial program<br>• Upload and enter data (parts, inspections, TILs) | • Testing and debugging (use testing tools)<br>• Commissioning<br>• Training |
| Client | Agree on naming, parts, inspections | • Data collection in electrical format pdf, doc, xls etc. To be send to GASRE for processing | • Prepare possible remote connections like: Access to internet, usage calc remote connections | • Training room<br>• Equipment (PC) |

**Figure 1. Priciple how work is divided.**

### 4.2 Data collection and report review by GASRE

The data gathering can be also performed by GASRE on an hourly rate of 135€/h.

Collection of the reports:

- maintenance reports
- planned inspection reports
- hot section part (set) refurbishment reports and life assessments
- forced outage reports and borescope reports
- Review of reports, used spare parts, implemented Service Bulletins.

Notable; Inspection and Repair report review and data collection is also a **Quality Assessment** of the quality of documentation, rotated spare parts and correct numbering of parts. This quality assessment gives added value to end user as it also highlights possible improvements in reporting by the Vendors.