



# SETTING PRIORITIES FOR ASSET REBUILD/REPLACEMENT SCHEDULES

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# Objective.

The objective of this presentation is to show different ways to prioritize maintenance on different assets within a glass manufacturing plant with the focus on glass melting furnaces, presenting different methods with their advantages and disadvantages.

Also explaining which different operational and conditional parameters shall be taken into account and how to assess condition of equipment to determine the priority of maintenance or replacements.

# Assets

The assets considered in this presentation are the main production components found in a glass plant. However the focus is on the glass melting furnaces, which in most cases are considered the most important asset in a plant. Mainly because failure of a melter can and will disrupt production completely or on multiple shops.

Other major assets in a glass production facility are:

- Production machines
- Lehrs
- Compressors
- Batch house

Depending on the risk factor assigned to the different asset a different approach to setting priorities can be considered.



# Age based scheduling



Age based scheduling is as it says solely based on the age of the asset, based on expected wear and lifetime.

Considering maintenance is performed timely and correctly.

- Pro's

- Well defined schedules for down time and spending (CAPEX and M&E)
- All assets can have a fixed depreciation

- Con's

- Repair too early, equipment still in good shape when wear does not represent expectations, resulting in unnecessary capital spending.
- Repair too late if wear is higher than anticipated, resulting in high maintenance cost until repair

# Operational based

Operational based scheduling is based on operational conditions and issues, like throughput, number of cycles, energy consumption, environmental constraints, quality, etc.

- Pro's

- Equipment will be best in class for energy and environment
- Less quality issues
- Equipment is kept in compliance with environmental requirements

- Con's

- Hard to schedule, due to possible sudden changes.
  - Changing regulations
  - Upset in quality by changes in asset condition
  - Changing energy consumption because of changes in asset condition
  - Unexpected asset failure
- Due to scheduling issues hard to forecast capital spending

# Condition based scheduling



Condition based scheduling is based on the evaluation of condition of the assets. This scheduling requires a rigid regime of maintenance, inspections and documentation of the assets condition. Frequent inspection by qualified inspectors, assessing the condition of the assets in a predefined way and without bias. All inspectors shall be aligned on how to rank the condition of the assets and associated risk evaluation

## ▪ Pro's

- Invest where needed
- Avoid unnecessary down time
- When asset condition is monitored and documented closely scheduling is easier

## ▪ Con's

- Requires diligent audits for the assets to assess condition changes over time across the company.
- Keeping inspectors aligned and inspecting without bias.

# Setting priorities for furnace maintenance schedules

- For the prioritization of furnace repairs/rebuilds, a combination of above mentioned methods shall be applied. However all methods shall not be taken into account equally, there needs to be a weighing factor for each of them to be combined in a priority number.
- Factors to take into account are, but not limited to:
  - Glass contact condition
  - Melter superstructure condition
  - Regenerator condition (if applicable)
  - Working end condition
  - Influence of condition on operations:
    - Energy consumption
    - Color changes
    - Furnace pressure
    - Etc.
  - Furnace operational parameters like: Throughput, Color changes, Energy consumption Etc.
  - Risk assessment





# Setting priorities for furnace maintenance/rebuild schedules

- Data collection
  - Frequent scheduled hot inspections
  - Regular updates on production information
  - Standardize data collection for all factors, including risk
  - Weigh different factors to balance influence on asset life and risk
  - Any changes in between inspections to be documented and data updated
- Data processing
  - Automated as much as possible
  - Updated on a weekly basis for all assets
- Ranking
  - Rank furnaces by total prioritization number, not by age, through put or condition only.
  - Highest number has the highest priority.

# Possible result

Region	Location	Furnace	Priority Score	Scheduled repair date
Europe	Paris	1	81.5	Q1-2020
APAC	Canberra	2	78.0	Q2-2020
Europe	Rome	A	77.5	Q4-2019
N. America	Denver	4	65.0	Q3-2020
S. America	Bogota	C	58.0	Q1-2021
APAC	Beijing	A	45.0	Q4-2022
Europe	Amsterdam	6	25.0	Q3-2030

Provide real time information for management to create a multi year schedule for asset maintenance or rebuilds.

# Other assets

- Production machines
  - Cycles
  - Quality issues
  - Maintenance cost
  - Oil leakage
  - Etc.
- Lehrs
  - Running time
  - Maintenance cost
  - Belt wear
  - Energy consumption
  - Etc.
- Compressors
  - Cycles
  - Maintenance cost
  - Failures
  - Pressure swings
  - Etc.
- Batch house
  - Weighing accuracy
  - Leakages
  - Maintenance
  - Etc.

# Questions

