

OPERATE YOUR PLANT EFFICIENTLY

Recipes for improvement



RECIPES FOR IMPROVEMENT

For a solution to be efficiently implemented – on a cement plant as anywhere else – it has to be a good solution. But a good solution is not enough. What determines the outcome is our confidence in the solution.

A clear sense of direction is fundamental to align efforts and make solutions come true.

In CemWise we communicate skillfully to combine our technical expertise with your staff's knowledge and experience from daily operation. We work to get to the bottom of things and provide you with an overview of:

- **the recipe to obtain your full potential**
 - how to reduce energy costs and maximize production
 - how to reduce crucial parameters like CO2 and other emissions
 - how to operate in the sweet spot of the profitable
 - how to deal with specific challenges
- **baseline and benchmark operation**
- **short-term and long-term improvement potential**
- **alternative solution scenarios**

Expert knowledge

CemWise experts all have a profound theoretical knowledge and years of practical experience within their fields of expertise.

They are as clear-cut in their evaluations as their professionalism and experience allows them to be, while they are also explicit about the known unknowns.

CemWise experts are characterized by a life-long curiosity and a due respect for unknown unknowns that often makes them scrutinize their conclusions with the CemWise panel of seasoned cement experts.

On-the-job training

A central trait to all CemWise experts is an enthusiasm to share knowledge.

They all possess a well developed ability to explain themselves thoroughly in a plain language to create clear and lasting understanding.

CemWise makes dedicated audit workshops for training, but any technical audit is also a chance for young engineers to get on-the-job training. The CemWise expert will take them along in his investigations, demonstrating methods and explaining findings and their significance.

A HANDBOOK AND AN ACTION PLAN

We want our audit reports to be a live tool of reference on the plant long after the CemWise specialist has left site. We therefore take great care to write the report in a way to make it useful.

Recommendations are structured and prioritized in an action plan that makes it easy to know what to do next. In the Action plan each of the recommended activities is linked to the report observation that explains why it is important and how it should be done.

 Action Plan Wonder Cement, Mill 4								
No.	Remedy	Actions	Ref.	Complexity	Responsible	Deadline	Done	Comments
Procedures and Studies								
1	Internal yearly mill audits	Execution and six months follow-up	5	2				
2	New crusher	Perform feasibility study	8	3				
3	Fuller pumps	Study feasibility of replacement	3-B	3				
Operational								
4	Feed control	Continuous optimization		1				
5	Reduce false air in mill system	False air campaign	5-B	2				
6	Grinding aid	Continue test	16-A	2				
Automation and Equipment								
7	Clinker size	Ensure optimal condition of clinker crusher	7	1				
8	Emergency generator	Install an generator	15-A	1				

REPORT CONSUMERS

When you are responsible to make good investment decisions for your organization, your need for knowledge is different than what is useful to the engineer heading out to execute a specific task.

With this difference in mind, we write our technical audit reports as a two-in-one report:

- **Executive report**
 - Causality Chart
 - Main steps for improvement
 - Alternative solutions scenarios
 - Commercial significance
- **Technical report**
 - Detailed observations
 - Practical recommendations
 - Action plan

FIELDS OF EXPERTISE

CemWise services cover cement manufacturing from quarry to dispatch. The services are offered at the level and extent that best suit client situation and objectives.

-  TECHNICAL AUDITS & OPTIMIZATIONS
-  IMPLEMENTATION SUPPORT
-  CONSULTATIONS & TROUBLESHOOTING
-  TRAINING WORKSHOPS
-  INVESTMENT PLANNING
-  TECHNICAL DUE DILIGENCE
-  INTELLIGENT REPORTS

1 GRINDING PROCESS

The majority of power consumption on the entire cement plant goes to the grinding processes. Ensuring efficient grinding can increase production capacity of the operating line.

We carefully inspect and evaluate each step of the grinding process as well as the needs for fineness of raw meal, coal or cement with due consideration to production capacity, energy costs and the effect on the downstream process.

BENEFITS

- Lower energy costs
- Increased production capacity
- Higher reliability

EVALUATIONS

- Internal inspection
- Heat Balance and false air
- Control loops and operation
- Ball mills:
 - Charge Composition
 - Tromp Curve and separator efficiency
- Vertical Roller Mill:
 - Gas and material flow patterns
 - Grinding bed

2 PYRO PROCESS

Pyro process is often the bottleneck to plant line capacity. A high, stable production at low cost is essential to the profit of a cement plant.

When we optimize a cement plant, many different perspectives need to be considered.

Alternative fuels and Petcoke are the most common ways of reducing fuel costs but combining them with high and stable production is often a challenge.

BENEFITS

- Increased production
- Lower fuel costs
- More stable kiln operation
- Increased refractory lifetime
- Higher reliability

EVALUATIONS

- Heat balance
- Volatile circulation
- Kiln feed and clinker chemistry
- Flame shape
- Cooler efficiency
- Disturbances to operation (snowman, coating in riser pipe, cyclone blockages, ring formation etc.)

3 ENERGY AND CO₂

The overall CO₂ emissions caused by cement production is increasingly coming under scrutiny by customers and the surrounding society.

Reduced energy consumption adds to the competitive edge in a market with increasing demands for low CO₂ emission cement. Being able to produce cement with less energy consumption will not only reduce impact on the climate, it will also lower costs of operation.

BENEFITS

- Produce cement with lowest possible CO₂ emissions
- Lower energy consumption
- Complete mapping of energy consumers

EVALUATIONS

- Inspection of equipment
- Evaluation of operation efficiency
- Possible additives to reduce clinker factor in cement
- Benchmarking of each department
- Possible investments to lower energy consumption

4 CAPACITY

Knowing the upgrade potential of existing equipment, their benefits and associated investment costs is the backbone of good investment planning. We identify the bottlenecks to production and evaluate condition of main equipment in view of client horizons and investment disposition to help prioritize between projects.

CemWise also offers independent performance tests of equipment and technical due diligence studies.

BENEFITS

- Current potential
- Benchmarking operation
- Investment potential
- Assessment of plant condition

EVALUATIONS

- Performance test main equipment
- Bottleneck identification
- Raw mix optimization
- Transport capacities
- Inspection of installation

5 INSTRUMENTATION

Some instruments are crucial for the efficiency of the line, such as gas analyzers or weigh feeders for correct calculation and accounting of consumed fuels and produced goods. Other instruments are critical through the interlocks, able to shut down the production line instantaneously.

Control loops may help to stabilize the production. But often they are not used to their optimum potential. The control loops may not be optimized correctly or they are not using the best inputs and outputs.

BENEFITS

- Increased reliability
- Precise accounting of fuels and production
- Improved stability

EVALUATIONS

- Define critical instrumentation
 - Functionality
 - Installation
- Maintenance routines
 - Control loops

6 QUALITY

A consistent high-quality product will not only make a competitive advantage in the market, it also has a significant impact on the performance of the whole manufacturing process.

We carefully investigate the process to control quality of input materials and all the intermediate products to improve and stabilize cement properties and simultaneously ensure a more stable plant operation.

BENEFITS

- Predictable and stable cement performance
- Improved plant performance
- Reduced material and energy cost
- Eliminate off spec product
- Visualization of quality information

EVALUATIONS

- Review sampling regimes and methods
- Quality control loops
- Automation of testing and sampling

7 QUARRY

The quarry is often the most important asset of a cement plant, yet it does not always get the attention it deserves. Often the lowest hanging fruits for the whole plant are found in the quarry.

How to stretch reserves to the maximum is only part of the objectives, we study. Other objectives include supplying raw materials at the right time and quality for improved raw mill, kiln and cement mill performance, as well as improving cement quality.

BENEFITS

- Maximized quarry life
- Lower production costs both in quarry and plant
- Mapping of influence on mills, kiln and cement quality

EVALUATIONS

- Mining plan and block model of quarry
- Minor elements
- Physical properties, such as moisture, size distribution etc.
- Alternative raw materials or additives
- Handling and logistics

8 EMISSIONS

It can be a challenge to keep emissions as low as possible, while also maintaining efficient production. Staying within government regulation is only a part of the equation, keeping on good foot with neighbours and customers is another reason for keeping emissions as low as possible.

Changes to process, fuels, raw materials etc. will often affect emissions, and it is important to be prepared for the effects before making the changes

BENEFITS

- Minimize emissions
- Being ready for the effect of changes in production process
- Lower costs of abatement operation

EVALUATIONS

- Dust emissions
- Filter performance
- SOx emissions
- NOx emissions

9 RELIABILITY

Sudden stops on a production line are expensive due to the loss of production, but not only that. During restarts fuel and electrical energy costs increase, product quality is often reduced and excess wear on refractory takes place.

Unplanned stops are often caused by minor issues, that can be avoided with a good reliability program.

BENEFITS

- Lower operating costs
- Reduced risk of operation to plant and personnel.
- Higher production
- Improved product quality
- Better reliability

EVALUATIONS

- Downtime Analysis
- Benchmarking of reliability of departments
- Preventative Maintenance program review
- Effectiveness of Root Cause Analysis

10 MECHANICAL

Main components often have a very long lifetime when well maintained. As time goes by, however, the risk of breakdown increases, and having available the correct strategical spare parts becomes only more crucial.

The condition of main equipment can often reveal risks of very serious breakdowns. A mechanical audit will evaluate the condition of the main equipment, routines of preventive maintenance and assess the stock of spare parts needed to reduce the risks for future operation.

BENEFITS

- Overview of potential risks
- Reduced risk for future operation
- Optimized strategic spare parts inventory

EVALUATIONS

- Main equipment condition
- Inspection program
- Strategic spare parts recommendations

11 ELECTRICAL

Efficiency of the electrical installation is an often-overlooked factor of the total energy cost.

Our careful evaluation of the whole electrical system can often lead to improvements in equipment reliability and reduced operating cost. Maintenance cost may also be reduced from updating equipment and operation.

BENEFITS

- Reduced power consumption
- Improved equipment reliability
- Improved operating schedule (energy price vs. operating hours)
- Possibility of early fault detection
- Optimized spare parts inventory

EVALUATIONS

- Design dimensions
- Usage patterns and needless running
- Outdated or in-efficient equipment, spare parts availability
- Noise, disturbances and harmonics
- Power factor correction

HOW TO ALIGN EFFORTS TO IMPROVE EFFICIENTLY

1 CLARIFICATION OF NEEDS

Before making a proposal, we make sure we understand your challenges and objectives. Together we identify the questions that need answers.

2 FIND THE FACTS

The first concern is to establish what facts can be relied on.

3 PROCESS KNOWLEDGE

Calculations and analyses are then made. The resulting findings are related to each other and compared to experience from similar cases.

4 HYPOTHEZIZE

Once a picture of causality emerges, new needs for facts arise to confirm these hypotheses. This insight producing cycle thus continues until the core of the matter can be firmly established.

5 QUENCH THE RECIPES

Having understood the relations between causes and effects, we proceed to outline the scenarios of possible solutions and the deliberate steps to get there.

6 A CLEAR SENSE OF DIRECTION

A conscious choice between the pros and cons of different solutions creates confidence in the chosen solution. With confidence a clear sense of direction arises that will make people align their efforts towards the common objective of an improved overall performance.

