

CEMENT SERVICES **ENHANCING YOUR PLANT**

EMPOWERING YOUR PEOPLE



OPTIMISING PLANT PERFORMANCE THROUGH SERVICE

How do you get the most from your cement plant? With plant managers around the world chasing sustainability and productivity goals, the number one word on everyone's lips is optimisation. Make more of your equipment; get more from your resources. And at the same time cut costs, reduce the clinker factor and minimise energy consumption.

Achieving all of these goals can feel impossible. But with the right services, we can get you there. Maximising equipment performance with a best practice operations and maintenance approach. Streamlining productivity using digital tools to enhance efficiency. And transferring knowledge and skills along the way.

KEY BENEFITS

Increase reliability
and availability

Reduce
downtime

Maximise energy
efficiency

Optimise
performance

Cut
costs

DISCOVER YOUR PLANT'S POTENTIAL

Achieving optimum plant performance requires an attentive approach to plant operations and maintenance. Our services provide both the insight and experience to deliver on your plant's potential.

SERVICES THAT ENHANCE PERFORMANCE

All machines need maintenance – but you can limit the cost and disruption of downtime by being prepared. Get ahead on shutdown and spare parts planning with inspections that help identify performance gaps, risks and opportunities.

And, when shutdowns are needed, our repair and refurbishment services draw on decades of experience to help you achieve optimum cost-effectively.

YOUR TECHNICAL PARTNERS

Across all our services, there is the opportunity to tackle issues on a case-by-case basis, or enter into a service agreement. Whichever route you choose, you will always benefit from the process and equipment expertise of our experienced service engineers and their attention to detail – regardless of the OEM. Whether it is an isolated repair or a larger upgrade, you have our support throughout your equipment's lifecycle.

DIGITALISATION DRIVES SUSTAINABILITY

Our digital capabilities enable us to resolve performance issues, enhance efficiency and improve availability. Continuous monitoring and analysis of your equipment opens up a more predictive maintenance approach that can eliminate unplanned downtime, increase productivity and efficiency, and help you meet your sustainability goals.

OUR SERVICES

WE SERVICE THE FULL FLOWSHEET OF CEMENT EQUIPMENT & PROCESSES

SERVICES BY TECHNOLOGY

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CRUSHING SERVICES

The best possible start for your cement production

Hammer crushers and impact crushers are highly efficient solutions for crushing raw materials. They are an integral part of cement production, and lay the foundation for an efficient overall process.

Close examination and good maintenance of your crusher is vital for your plant's overall productivity. When an issue arises, it is important to act fast in order to avoid poor performance, stoppages and costly repairs.

Regular crusher inspections and ongoing technical support can prevent failures or breakdowns before they occur. Fuller's crusher services ensure your equipment keeps operating at maximum efficiency.

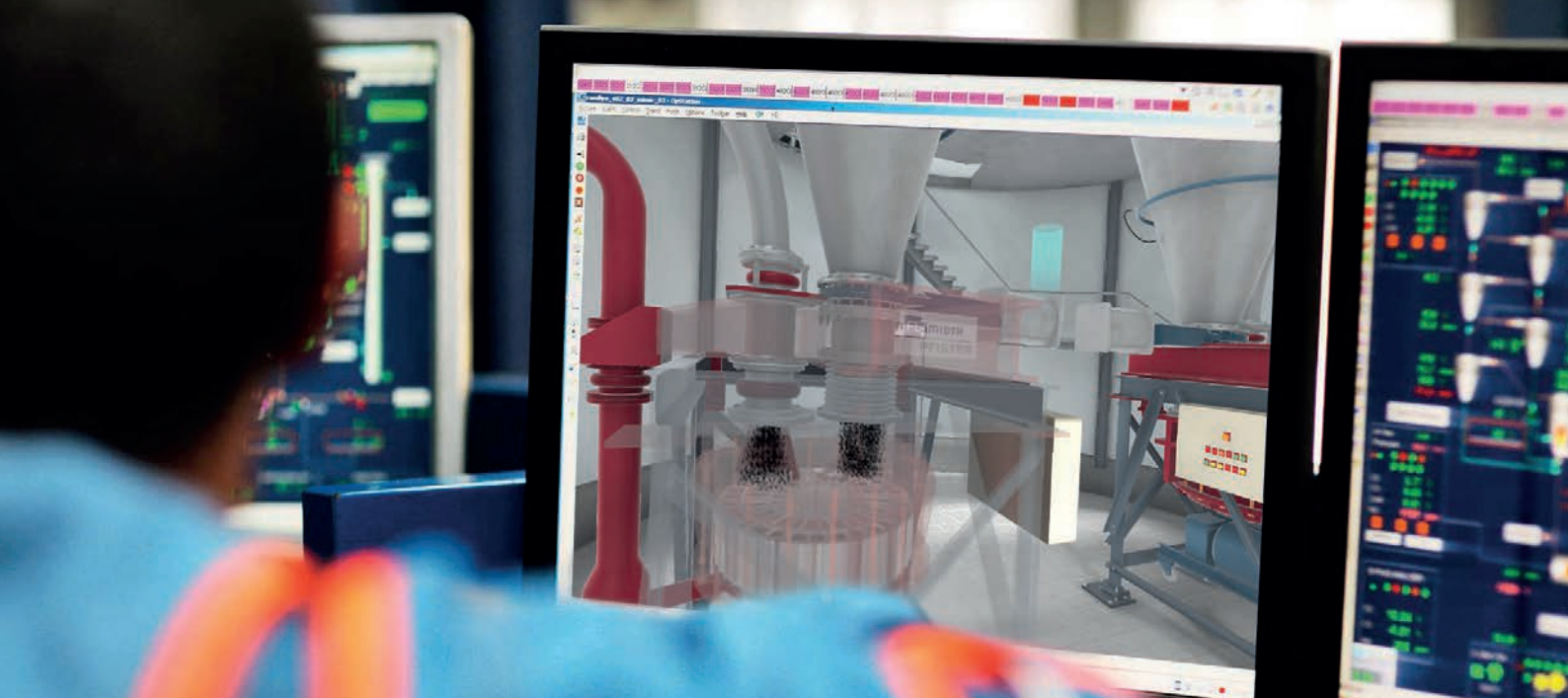
We identify and eliminate root causes, helping you avoid important operating issues

- Excessive downtime
- Capacity decrease
- Change in output size
- Chain wear
- Repeated failures
- Vibrations

Our crusher on-site maintenance services include hard facing of rotor discs, hammers, vibration analysis and balancing of crusher components. For everything from apron feeder alignments and retrofit to spare parts replacements, we work closely with you to oversee repairs and ensure all correct tolerances are achieved.

INSPECTION CONTENT		INSPECTION CONTENT	
External inspection	<ul style="list-style-type: none"> • Visual inspection of feed material and spillage from casing • CCR trend curve analysis • Casing inspection incl. analysis of potential dents • Casing assembly and wear plate bolts • Main shaft sealing check 	Hydraulic & bearing inspection	<ul style="list-style-type: none"> • Inspection of hydraulics, cylinders and oil analysis • Cylinder and hoses functionality, pressure and leakage • Extraction tool inspection • Bearing external/internal (cleaning) inspection
Internal inspection	<ul style="list-style-type: none"> • Flaps (feeding connection) • Visual inspection of wear plates (chipping, cracks) • Inlet roller inspection • Rotor disc and hammer inspection (wear, chipping, cracks) • Stay bolts and hammer bolt inspection • Functionality and position of anvil - wear plate inspection • Spot check of rotor disc and hammers using penetrant fluid • Inspection for wear, dents and cracks in outlet grate bars • Outlet grate positioning and hammer wear 	Drive & electrical inspection	<ul style="list-style-type: none"> • Visual inspection of gearbox and bearings • Oil sample check from gear box • Check of coupling and membrane plates pins • Check of all connections/functionality against CCR data • Motion and temperature sensors
		Apron feeder	<ul style="list-style-type: none"> • Visual inspection of skirt plates, frame and lamellas • Frame alignment check (frame railways parallel) • Horizontal alignment of drive and tension shaft • Inspection of chain and chain sprockets (wear, screw) • Bearing inspection/ check of base plates • Support roller wear, rail and lubrication system inspection • Take-up system inspection • Pressure check, cylinder hose functionality • Load curves for VFD drives

Recommended inspection frequency **Every one to three years**



PFISTER® FEEDING & DOSING EQUIPMENT SERVICES

Increase performance through preventive maintenance

Why wear matters

In harsh industrial environments, wear is inevitable. This is particularly true for the wear parts of your feeding and dosing system, such as the rotor wheels and sealing plates. But though wear is continuous, its impact can vary over time.

Checking the condition of your parts can help to prevent downtime and avoid the need for premature replacements. The right maintenance at the right time can save you valuable production time, money and peace of mind.

Timing is everything

There are three phases of wear: the running-in phase, the stationary phase, and the critical phase. Once you reach the critical phase, system failure is imminent, and performance can decrease. With more than 140 years' experience producing and servicing our equipment, we have extensive expertise in the operation and maintenance of feeding and dosing products.

Key benefits

- Maintained dosing accuracy
- Saved costs through pre-planned production outages
- Support for crucial spare-part management
- Increased machine life
- Lower operational costs

We use this experience to plan an inspection program tailored to your operation. Based on the insights gathered during the inspections, we can then advise what needs to be done and when, for optimum performance. The result? Increased machine life and reduced service and operation costs.

Our feeding and dosing equipment services include:

- Visual inspection of the equipment
- Software update
- Exchange of wear/spare parts
- Calibration of the system
- Spare part recommendation
- Software/data back up

Don't let wear affect your production goals. Achieve stable and accurate performance with an optimised feeding and dosing system.

Remote Service Pfister feeders can be connected to the internet, and the 24/7 hotline can connect and support remotely (remote hardware required).

Remote Service Agreements Remote troubleshooting, quarterly performance reports, yearly visits, customized to meet your needs with a focus on performance optimization and reducing downtime.

Training (www.fuller-technologies.com/institute/training) Onsite, Online or at Pfister production facility in Italy.



GEAR SERVICES

Maximise equipment availability
with a well-functioning gear

A gear is meant to drive the mill with the right speed and power, efficiently and with minimum downtime. In fact, the mill's availability is totally dependent on the gear unit's condition and performance.

Our gear inspection services determine the status and condition of the individual components in your gear unit. We help you to identify and eliminate root causes of performance bottlenecks, preventing all kinds of wear and bearing damage, as well as pitting, fracture, adhesion and scuffing.

We machine the gear internals, grinding them to a very narrow profile and helix tolerances. This ensures the required tooth contact in the gearing and helps maintain the correct alignment and lubrication.

Our gear services are provided by our experienced gear experts, working closely with our engineering and other service departments. We assist with all aspects of installation and start-up of new gears and gear replacements.

For further insights into how the gear is operating and when maintenance is precisely required, we recommend adding our online condition monitoring services. This service complements onsite inspections and can extend the operational warranty of new gears.

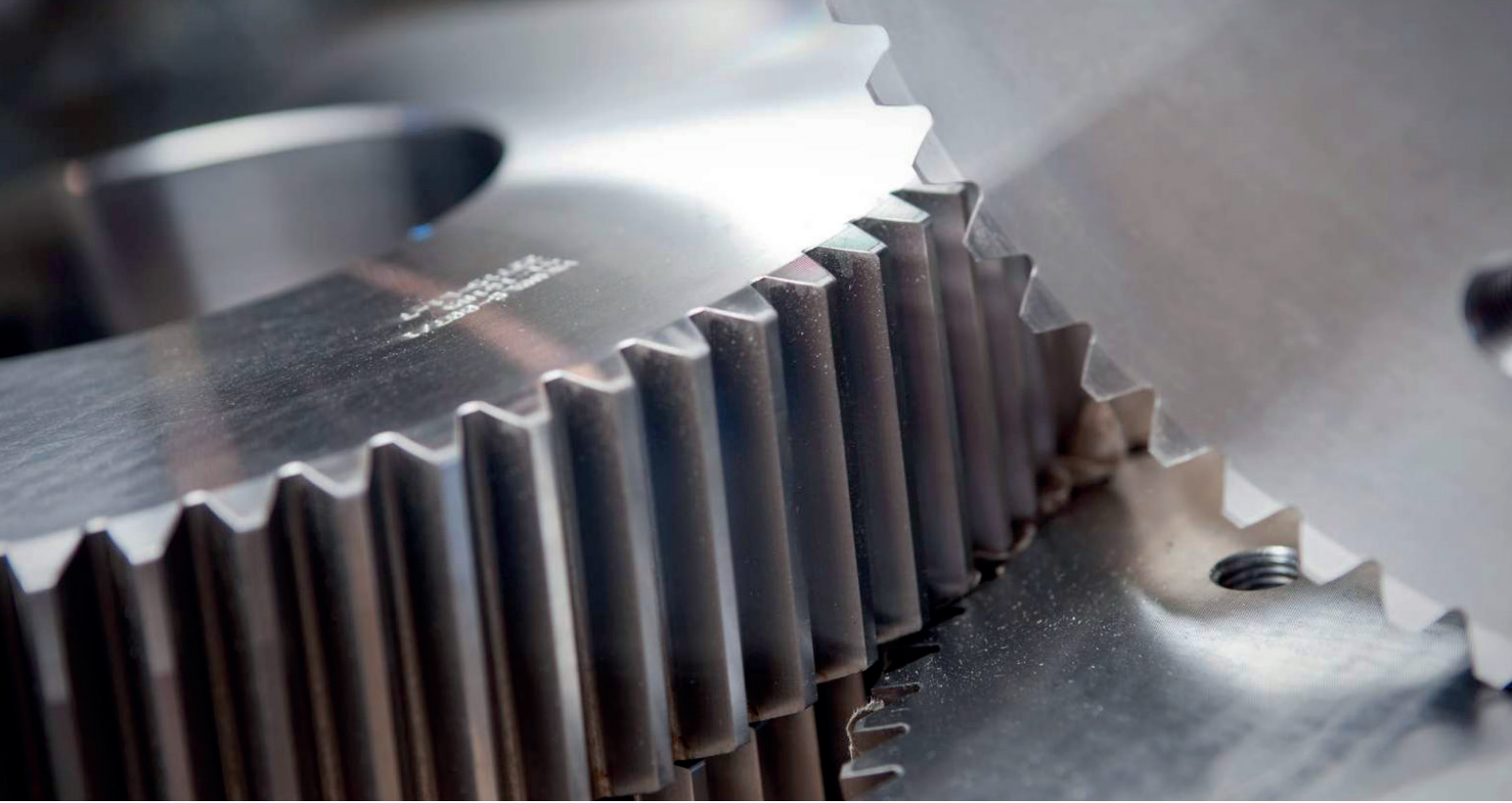
We carry out the complete range of gear overhaul and repair activities for all parts, including rotating parts, bearings and designed components. This includes:

- Dismantling parts and evaluating their health
- Repairing and replacing parts
- Assembling and function testing

INSPECTION CONTENT

Mechanical condition	<ul style="list-style-type: none"> ▪ Tooth surface condition ▪ Tooth contact conditions ▪ Alignment check ▪ Run-out check ▪ Rotary backlash ▪ Bearing seals condition ▪ Coupling conditions ▪ Sealing condition ▪ Foundation condition ▪ Membrane characteristic
Vibration measurement	<ul style="list-style-type: none"> ▪ Broad band evaluation ▪ Narrow band measurement ▪ Vibration analysis and conclusion ▪ Vibration monitor configuration
Lubrication	<ul style="list-style-type: none"> ▪ Oil level check ▪ Oil temperature, flow and pressure check ▪ Pump, filter and cooler function test ▪ Oil analysis evaluation ▪ Oil analysis performance
Interlock	<ul style="list-style-type: none"> ▪ Check of interlocking ▪ Check of safety system ▪ Check of overload ▪ Recommendation for safety device updates
NDT test of critical parts	<ul style="list-style-type: none"> ▪ Supervision of magneto flux (surface cracks) ▪ Supervision of ultrasonic test (sub-surface cracks)

Recommended inspection frequency: Every year, or after 1000, 6000 and 12 000 running hours



ONLINE CONDITION MONITORING SERVICES FOR GEARS

Reduce unplanned downtime and extend gear life

Optimise gear health and efficiency

Online condition monitoring services for gears continuously monitor all aspects of your gear unit, so you can address issues at the right time and reduce maintenance costs.

Sensors gather relevant operating data from the gear unit and send it to our team of experts, who continuously supervise and report significant changes or problems.

This service monitors symptoms that can't be detected by regular maintenance alone and it complements on-site preventive maintenance. Our gear specialists interpret the data and give you recommendations and solutions to achieve optimum gear health.

We carry out the complete range of gear overhaul and repair activities for all parts, including rotating parts, bearings and designed components. This includes:

- Dismantling parts and evaluating their health
- Repairing and replacing parts
- Assembling and function testing

Identifying issues early gives you time to act before sudden failure occurs. You can source parts and make sound decisions based on reliable, insightful data.

- **What?** Continuous gear health monitoring and incident support; regular reports summarising alarms and maintenance recommendations; trend analysis and frequency spectra.
- **Outcome:** You can predict failures that are not possible to predict with on-site preventive maintenance alone. You can therefore take timely action to significantly reduce the chance of gear failure.
- **Reference case:** Enhanced data analysis from this service detected a bevel gear bearing failure at a very early stage. In contrast, regular maintenance can detect this type of failure only just before it becomes serious, giving the plant team insufficient time to source spare parts and organise a repair intervention. Identifying the defect early meant production could continue uninterrupted until the next planned plant shut-down, thus avoiding expensive emergency repair costs.

We are able to monitor gears and can combine this service with VRM online condition monitoring, to ensure that your entire mill system is running smoothly and efficiently.



PNEUMATIC CONVEYING SERVICES

Maintain and enhance your pneumatic system

From initial installation to repairs, upgrades, and preventive maintenance, we offer you tailored and cost-effective on-site services to ensure optimised pneumatic conveying systems. Use our expertise to help maintain and enhance your equipment, while reducing the cost of operation.

Through years of innovation and experience, we developed a vast global pool of specialist engineering resources, unique on the market, so we can fully support you at every stage of your operational process.

We accomplish this through world-class services and equipment programmes, by providing sound productivity-enhancing solutions based on our expertise, and a close communication and collaboration with you.

Key benefits

- Enhance plant productivity with the highest and most reliable conveying capacity
- Reduce equipment downtime and minimise the risk of conveying pipe blockages
- Lower energy consumption and the cost of operation
- Easily upgrade your equipment and system
- Improvements in pneumatic conveying system can have positive effects on both upstream and downstream equipment

Pneumatic conveying is at the core of your material handling system, using either:

- Fuller Kinyon® screw pumps (FK Pump),
- Pressure vessel systems.
- V-Series Rotary Airlock.



INSPECTION CONTENT

System in operation External inspection

Visual inspection of:

- Feed system
- Pump body/Pressure tank/ Airlock housing
- Valves and Bearing houses
- Convey piping and diverter valves
- Venting on Pump and delivery silo/bin
- LCP or CCR trend analysis
- System in operation, incl. setpoints and control system setup
- Bearing temperature measuring
- Compressor/blower check

System stopped Internal inspection

Visual inspection of:

- Bearing houses
- Pump screw
- Measuring tolerances
- Discharge chamber
- Pump internals
- Inlet valve seal
- Nozzles

Visual inspection of lubrication:

- Pneu-Flap™ transmission oil level check
- Grease content in bearing houses
- Oil level in mist lubricator on pneumatic panel

Recommended pneumatic conveying system inspection frequency: **Every year**



BALL MILL SERVICES

Maintain maximum mill efficiency

To help you maintain optimal operating conditions, Fuller provides on-site maintenance services for all types of ball mills, covering all needs from regular inspections to repair and installation services.

To target and eliminate the root cause of any problem, as part of our inspections we collect and evaluate data and measurements both during mill standstill and operation.

Focus on the details

When we assist with and provide you technical advice for mill repairs and installation of parts, we focus on achieving the correct tolerances and correct installation, in a fast and safe way, to help you minimise your shutdown time. We offer the full range of activities:

- Replacing or reversing the girth gear, pinion and drive
- Replacing mill trunnion
- Replacing mill sections and head walls
- Replacing or repairing mill bearing liner and slide shoe bearings
- In-situ machining of mill trunnion and slide ring
- Changing inlet and outlet cones
- Changing diaphragms and liners

We help you identify and eliminate root causes of performance bottlenecks, preventing:

- Excessive wear on bearings
- Journals, trunnion bearings or slide shoes
- Hydraulic system issues
- Decreased production capacity
- Contamination of lubrication oil

INSPECTION CONTENT		
Mill visual inspection	<ul style="list-style-type: none"> ▪ Ball mill foundation and drive foundation condition ▪ Mill shell, trunnion and door conditions 	<ul style="list-style-type: none"> ▪ Ball mill inlet and outlet conditions ▪ Bearing seals condition
Mill bearing lubrication system	<ul style="list-style-type: none"> ▪ Oil level ▪ Oil temperature, flow and pressure 	<ul style="list-style-type: none"> ▪ Pump, filter and cooler function ▪ Operation analysis
Gear box and lubrication system	<ul style="list-style-type: none"> ▪ Oil level ▪ Oil temperature, flow and pressure 	<ul style="list-style-type: none"> ▪ Pump, filter and cooler function ▪ Visual check of gearbox
Separator	<ul style="list-style-type: none"> ▪ Housing and wear condition ▪ Grease lubrication unit functionality 	<ul style="list-style-type: none"> ▪ Bearing condition; upper, middle and lower ▪ Wear on guide vanes and rotor
Mill bearings condition checks	<ul style="list-style-type: none"> ▪ Mill bearing clearances ▪ Mill bearing condition check ▪ Mill bearing axial clearance check 	<ul style="list-style-type: none"> ▪ Trunnion surface condition check ▪ Mill lift measure by high pump pressure
Girth gear	<ul style="list-style-type: none"> ▪ Girth gear radial and axial reading ▪ Girth gear root gap and backlash readings ▪ Girth gear and pinion tooth evaluation 	<ul style="list-style-type: none"> ▪ Girth gear and pinion alignment evaluation ▪ Grease spray and grease consumption evaluation
Recommended inspection frequency: Every one to two years		



LINE BORING SERVICES

Mill bearing in perfect working condition

Vibration and other site-specific operating conditions can cause mill bearings to become deformed or worn. Beyond a critical point, machining is necessary to bring the bearings back to smooth working condition.

We provide on-site line boring services for any vertical mill pedestal bearing and similar type of heavy equipment. This is especially useful for large equipment that cannot be dismantled and transported offsite to a workshop.

Specialised equipment requires specialised know-how

With our own portable line boring machining equipment, we machine the inner diameter of the bearings. Featuring a fully adjustable lathe, our tools are easy to adapt and can be applied to any size of bearing. The inner diameter micrometre connector enables the precise adjustment that is so essential to a successful outcome.

Our service engineers define the best working conditions and tolerances to achieve optimum operational conditions. We work with an extremely high level of accuracy and quality standards:

- Tolerance range of 0.01 mm
- Surface quality of RA 1.6
- S1 Standards welding quality

Line boring typically takes five to seven days for one set of pedestals.





MILL START-UP SERVICE

Get the most out of your grinding circuit

Ensure long-term performance with an optimised mill start-up

Inefficient operation of your vertical roller mill can impair product quality, increase running costs and reduce the life of key components and wear parts. Often, these inefficiencies can be avoided simply by setting the correct operations and maintenance parameters right from the beginning.

A flying start

To get your grinding operation off to a strong start and set yourself up for long-term success, call in our experts each time you bring your Fuller vertical roller mill back into operation – for example, during and right after the installation of new wear parts, or after overhauling your mill.

Our mill start-up service includes expert advice to give you a full overview of the mill condition and recommendations for optimal operation and maintenance.

Benefits

- Know and improve the mill circuit's mechanical and operational condition
- Increase equipment availability and reliability
- Develop a more proactive maintenance approach
- Optimise start-up and operation of the mill
- Upskill your team
- Reduce OPEX and get a longer lasting, sustainable solution

What's included with the mill start-up service?

- Status of mill circuit condition
- Finetuning of the Fuller vertical roller mill operating and process parameters
- Guidance for Operations manager to update operating practices according to the new mill setup
- High-level service report
- Technical on-site expertise from an Fuller specialist

Our services make the most of digital tools to deliver easy, responsive and personalised services with the high standard assured by our strength as an OEM. At the end of the site inspection, we'll present the findings in-person to the plant personnel before following up with a service report.





ONLINE CONDITION MONITORING SERVICES FOR ATOX® MILLS

Proactive maintenance strategy
to eliminate unexpected downtime

Sustain maximum mill performance

Our online condition monitoring services for ATOX® mills let you keep a constant eye on critical operating parameters and settings, ensuring optimised mill reliability and performance.

This service helps detect early symptoms that can't be detected by regular on-site maintenance alone. Standard sensors on the mill monitor parameters such as gas flow pressure and temperature, and hydraulic grinding pressure.

With continuous monitoring, you can ensure these parameters are all consistently maintained, giving you plenty of time to take planned action before problems become severe.

We are able to monitor both Fuller and other OEM mills. Additionally, we monitor mill and gear condition in an integrated way, relying on our digital capabilities and expertise in both types of equipment,

With Level I service, we monitor:

- Operating conditions
- Mill air circuit
- Mill fan efficiency
- Grinding hydraulic system
- Roller and table wear liner life
- Separator top seal

With Level II service, we monitor all of the above plus:

- Bearing temperatures
- High resolution gear and bearing vibrations
- Lubrication oil pressure and flow
- Input torque on mill gears
- Table wobbling and tilting on mill gears

ensuring your entire mill system is healthy and efficient. Our specialists interpret the data and give you qualified analysis and expert recommendations for a healthy, optimised mill system.

- **What?** Continuous ATOX® mill health monitoring and incident support; regular reports summarising alarms and recommendations; clear, actionable insights that you can implement to reduce operating costs and optimise performance.
- **Outcome:** Predict potential problems in critical components or subsystems in the mill circuit and prevent them from negatively impacting overall mill operation.
- **Reference case:** The early onset of instability in grinding pressure caused by cylinder seal leaks was detected by this service before the more severe symptoms of lost production or product quality were seen. Replacing a piston seal during a planned maintenance schedule ensured regular production was maintained.

To further enhance performance, we can combine online condition monitoring with on-site inspections of your mill. When these accompany new mills or specific mill engineered parts, we can provide additional benefits such as extending warranty of the parts and increasing the mill availability.



ONLINE CONDITION MONITORING SERVICES FOR OKTM MILLS

Proactive maintenance strategy to eliminate unexpected downtime

The OKTM Mill is manufactured by Fuller under patent and license from Kobe Steel Ltd. & Taiheiyo Cement Corp.

Sustain maximum mill performance

Our online condition monitoring services for OKTM mills let you keep a constant eye on critical operating parameters and settings, ensuring optimised mill reliability and performance. Whether you do this for a new mill or one that has been running for many years, this service helps detect those early symptoms that may not be visible through regular on-site maintenance alone. Standard sensors on the mill monitor critical performance parameters, for example gas flow pressure and temperature, and hydraulic grinding pressure. With continuous monitoring, you can ensure critical components are consistently performing, and if performance degrades you are given advanced notice, enabling you to take planned maintenance action before problems become severe.

We are able to monitor both Fuller Cememtn mills and mills from other suppliers. Additionally, we monitor the mill and gear condition in an integrated system, relying on our digital capabilities and expertise in both types of equipment, to ensure your entire mill system is running with peak efficiency.

Our specialists interpret the data and give you qualified analysis and expert recommendation to maintain an optimised mill system.

To further enhance performance, we can combine online condition monitoring with on-site inspections and maintenance support. When these accompany new mills or specific mill engineered parts we can provide additional benefits of an extended warranty and increased mill availability.

With Level I service, we monitor:

- Operating conditions
- Mill air circuit
- Mill fan efficiency
- Grinding hydraulic system
- Roller and table wear liner life
- Separator top seal

With Level II service, we monitor all of the above plus:

- Roller position and speed
- Mechanical stopper impact and force
- Bearing temperatures
- High resolution gear and bearing vibrations
- Lubrication oil pressure and flow
- Input torque on mill gears
- Table wobbling and tilting on mill gears

- **What?** Continuous OK mill health monitoring and incident support; regular reports summarising alarms and recommendations; clear, actionable insights that you can implement to reduce operating costs and optimise performance.
- **Outcome:** Predict potential problems in critical components or subsystems in the mill circuit and take proactive action to prevent them from negatively impacting overall mill operation.
- **Reference case:** The early onset of instability in grinding pressure caused by cylinder seal leaks was detected by this service before the more severe symptoms of lost production or product quality were seen. Replacing a piston seal during a planned maintenance schedule ensured regular production was maintained.



VERTICAL ROLLER MILL SERVICES

Improve energy efficiency and mill performance

Vertical roller mills (VRMs) are firmly established in the production lines of plants all over the world. To ensure that your mill operates at maximum efficiency, we offer a wide range of on-site services, from periodic mill inspections and expert technical support, to repair and installation services.

Based on our decades of experience in manufacturing vertical mills, we can provide important insights into your mill's performance, both through customised inspections and ongoing technical support. Your mill is serviced by an experienced vertical mill specialist during the planned shutdown period, and we can also assist with troubleshooting services, should emergencies occur.

For further insights into how your OK™ or ATOX™ mill is operating and when maintenance is precisely required, we recommend combining on-site inspections with our online condition monitoring services. When these accompany new mills or specific engineered parts, we can provide additional benefits, such as extending the warranty of the parts and increasing mill availability.

Unique safety features

We assist with the complete range of maintenance activities, ensuring all the correct tolerances and that parts are installed correctly.

The OK™ Mill is manufactured by Fuller under patent and license from Kobe Steel Ltd. & Taiheiyo Cement Corp.

We help you identify and eliminate root causes of performance bottlenecks, preventing:

- Excessive downtime
- Hydraulic system failures
- Contaminated lubrication oil
- Oil leakage from rollers
- Repeated failures
- Vibrations

INSPECTION CONTENT

Hydraulic system	<ul style="list-style-type: none"> Hydraulic operation data logging and pump analysis Nitrogen system condition check Oil reservoir leakage, filter and cooling system Tensioning cylinder condition 	<ul style="list-style-type: none"> Hydraulic max. pressure and oil cleanliness test Setting and adjustment of plant valve Control system adjustment and alarm list investigation Active Vibration Damping (AVD)
Lubrication system	<ul style="list-style-type: none"> Lubrication operation data logging, setpoints and data Bearing condition analysis through oil filters and oil sample analysis Start/stop limits for feed pumps 	<ul style="list-style-type: none"> Oil cooling system condition Control system adjustment and alarm list investigation
Visual inspection	<ul style="list-style-type: none"> Sealing air fan system condition* Mill housing, liners, feedtube, scrapers and dam ring Material and oil leakage inspection Mill foundation and housing condition 	<ul style="list-style-type: none"> Water injection system HiCr/Hardfaced/Sintercast Reject system Grinding aid for OK™ Mill** Material outlet and inlet bellows
Roller assembly and tensioning system	<ul style="list-style-type: none"> Front/rear oil seal and seal air ring condition* Joint head, torque rod and pull rod condition* Rollers centering on table*, fixation segments/clamps Grinding segment profile analysis Swing out roller system condition**/*/* 	<ul style="list-style-type: none"> Thrust bearing at fulcrum shaft** Adjustment of mechanical roller stopper** Bearing condition; bearing clearance Min. gap between rollers/table segments**
Separator	<ul style="list-style-type: none"> Housing and attachment to mill Grease lubrication unit functionality Rotor seal wear and seal gaps 	<ul style="list-style-type: none"> Wear on guide vanes and rotor CCR operation data analysis

* For ATOX® mill inspections

** For OK™ mill inspections

*** For FRM™ mill inspections

Recommended inspection frequency: **Every year**



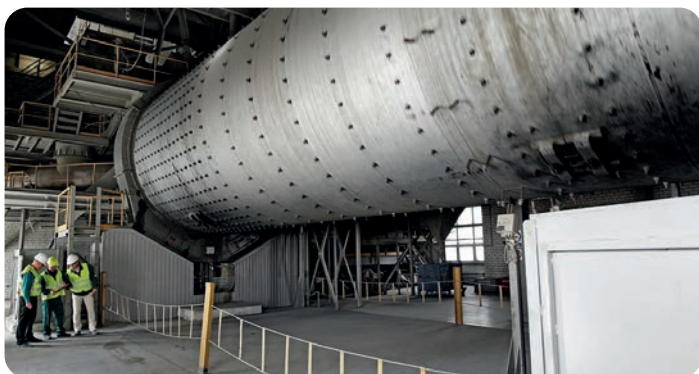
WHITE METAL BEARINGS REFURBISHMENT

Reduce costs and increase mill availability with our comprehensive bearing refurbishment service

Long-term performance gains

Your white metal bearings are critical to your mill operation – but they are also subject to wear and build-up, which can lead to failure. And when the bearings fail, the mill stops, costing you valuable production time and triggering unexpected repair costs.

Keeping bearings in good condition ensures optimum mill performance in the long-term. Our state-of-the-art bearing liner refurbishment services deliver as-new parts that will cut downtime, increase productivity and save you money.



Key benefits

- Reduce the wear of bearings
- Improve mill availability
- Optimise mill performance
- Save money on new parts

Extend bearing life

Bearing damage can happen in a number of ways. For example, lime deposits in the cooling chamber can prevent the cooling water from working effectively, leading to overheating bearings.

Contaminants in the oil film can cause wear on sliding surfaces, impacting bearing performance. Our bearing refurbishment services are designed to address this damage, with a comprehensive programme comprising several stages:

- Mechanical cleaning and bearing measurement
- Acid bath – both on the surface as well as in the cooling chambers/channels to clean the lime and deposits in the water chamber. This can take up to 6 days in extreme cases.
- Heating – ensuring the shoes are degreased
- Surface treatment (steel blasting) to optimise the bearing surface for white metal layer retention
- Pressure test of the shoes – cooling chambers/channels and lubrication oil tube
- Tinning
- White metal layer implementation
- Machining
- Measuring – ensures minimal scraping of white metal during bearing installation
- Final treatment, i.e., painting, anticorrosive treatment of non-painted areas, and lubrication with acid-free grease

Each stage of the refurbishment is carefully prepared and executed to ensure we deliver an as-new product that meets our high manufacturing standards and provides many years of operation. Even with such a comprehensive service, we can carry out bearing refurbishments in our workshop in 6 – 14 days in urgent situations.



FIRST-TIME SERVICE AGREEMENTS FOR NEW OK™ MILL AND KEY OK MILL COMPONENTS

The OK™ Mill is manufactured by Fuller under patent and license from Kobe Steel Ltd. & Taiheiyu Cement Corp.

Maximise availability and reduce your operating costs with a service agreement on Fuller OK Mill and key OK Mill components

OK Mill components with extended warranty*

- Roller assembly (3-5 years)
- Swing lever (5 years)
- Shaft assembly (5 years)
- Grinding table casting (5 years)

Warranties are applicable only with 5-year service agreement including on-site inspections and online condition monitoring services

*Wear/consumable parts are not covered by the extended warranty.

5

YEARS WARRANTY

On key OK Mill parts

The service agreements are structured as yearly subscriptions, making it easy to include in your plant's annual maintenance budget.

Benefits

- Extend your warranty on key components
- Increase OK Mill availability
- Cut maintenance costs
- Increase ROI and reduce total cost of ownership
- Optimise OK Mill maintenance
- Upskill your operators

Maximise your ROI

Purchasing an OK Mill or engineered part is an investment in the future of your plant. Our service agreements ensure you get the most from your investment, with greater equipment life, performance and cost-efficiency.

Extended warranty on key components

Our first-time service agreements give you an extended warranty on key OK Mill parts, helping you save costs on repairs and eliminate the risk of long lead times and associated downtime. This applies to key components purchased with new OK Mills or replaced on installed OK Mills.

Preventive maintenance and predictive analytics to increase OK Mill reliability

Online condition monitoring services help you reduce or even eliminate unexpected downtime. The service also includes expert insights that enable you to optimise the timing and frequency of hardfacing and liner replacement. Together, these services optimise maintenance planning and reduce operating costs. Even better, your team gains by working with our experienced technicians, so they can operate the OK Mill and its components at optimum performance levels.

Service scope	Year				
	1	2	3	4	5
On-site Inspections	✓	✓	✓	✓	✓
Online Condition Monitoring Services	Annual service subscription for 5 years, Online				
Fuller Maintenance Assistance App.	Annual service subscription for 5 years, Online				



COMPREHENSIVE HOT KILN ALIGNMENT

A comprehensive analysis of your kiln enables you to get to the heart of kiln problems, reducing downtime and increasing productivity

Unplanned kiln downtime is costly and damaging. Eliminate it with a preventive maintenance strategy based on tools that deliver real kiln data and expert insight.

Our comprehensive hot kiln alignment gives you a clear diagnosis of the state of your kiln. Using advanced measurements and specialist tools, we deliver a full kiln analysis looking at the key problem areas: kiln axis, kiln shell ovality, axial balance and kiln crank. We also conduct an engineering study, which looks at kiln stiffness, stresses and potential overload. The highest priority is to identify the true root causes of any actual or potential issues, and to deliver recommendations that enable you to act before these problems become critical. Finally, we report all our findings back to you in a written document and meet with you to discuss this report and your next steps.

Visualise your kiln

Using state-of-the-art software, we create detailed, interactive 3D rotating models of your kiln shell, which let you see any areas of damage or weak spots, with different colours indicating the varying degree of severity. We include these detailed models in your final report, giving you the insights you need to prepare an appropriate preventive maintenance plan.

Benefits

- Increase kiln availability
- Reduce unplanned downtime
- Cut maintenance costs
- Increase productivity



More informed operations and maintenance

Understanding the influence of the different measurements helps kiln operators and maintenance staff determine the most efficient mode of operation, and fully prepare for maintenance stops. A comprehensive hot kiln alignment puts you on the right path for optimum productivity and performance.

For further insights into how the kiln is operating and when maintenance and parts-replacement is needed, we recommend adding our online condition monitoring services for kilns. When purchased in combination with Hot Kiln Alignment and specific engineered parts from Fuller, the online condition monitoring extends the warranty of the respective parts and further enhances the health and availability of the kiln.



HOT KILN INSPECTION FOR THE ROTAX-2® ROTARY KILN

Extend the life of your kiln
with regular hot kiln inspections

ROTAX-2® HOT KILN INSPECTION DURING OPERATION		
Tyre tangential suspension	<ul style="list-style-type: none"> Visual inspection Tensioning rods - free overhanging lengths 	<ul style="list-style-type: none"> Visual assessment
Shell analyses	<ul style="list-style-type: none"> Polar diagrams Kiln shell centre runout Kiln shell deformation 	<ul style="list-style-type: none"> Kiln shell temperature Tyre throw
Axial balance	<ul style="list-style-type: none"> Supporting rollers and tyre profiles Bearing and thrust bearing temperatures 	<ul style="list-style-type: none"> Thrust device condition and position
Kiln drive	<ul style="list-style-type: none"> Check of drive controller setting (Applies for ABB only. Requires a short kiln stop) 	<ul style="list-style-type: none"> Drive station vibration measurement
Supporting measurements and comprehensive visual inspection	<ul style="list-style-type: none"> Bearing position Base plate levelling Base plate tilting Tyre and supporting roller diameter 	<ul style="list-style-type: none"> Tyre position on supporting rollers Visual condition check of kiln components
Engineering study*	<ul style="list-style-type: none"> Load on bearings Bending stresses in tyres Contact pressure between supporting rollers and tyres 	<ul style="list-style-type: none"> Bending stresses in kiln shell Shell stress calculation due to reduced shell thickness
* Optional		

Benefits

- Keep an eye on the kiln without disrupting production
- Extend kiln life
- Increase lining life
- Maximise availability and reliability

Address kiln issues before they escalate

Your ROTAX-2® Rotary Kiln is central to your productivity – so it's essential to keep a close eye on it. Extremely high kiln temperatures can cause a number of issues with kiln shape and alignment. Regular inspections can help extend the life of your kiln without disrupting production.

Tangential suspension service

The tyre's tangential suspension reduces the shell ovality, allowing the kiln shell to expand in the radial direction during heating.

Our inspection will give you a clear picture of how your tangential suspension system is performing and enables you to service the components in due time, before failures can happen.

Preventive maintenance through analysis

In addition to the tangential suspension service, the hot kiln inspection includes a variety of checks and analyses (listed in the table to the right).

In essence, the inspection is a comprehensive analysis that reveals the condition of the kiln. It focuses on root cause analysis on existing kiln issues and supports the planning of maintenance work. All in all, this facilitates a preventive maintenance approach.

For further insights into how the kiln is operating and when maintenance and parts-replacement is needed, we recommend adding our online condition monitoring services for kilns. This added service also extends the warranty of specific engineered parts.



KILN RESURFACING

Extend the life of your kiln with
our resurfacing services

Don't let wear bring you down

Your kiln is in near-continuous use – so wear is to be expected. Tyres and rollers naturally form irregular surface profiles from roller skew, as well as pitting, spalling, irregular markings and rolled-over edges. Left unaddressed, these conditions can lead to increased power consumption, alignment problems and reduced bearing life.



Key benefits

- Improve mechanical stability
- Reduce energy consumption by up to 40%
- Lower operating costs
- Eliminate vibrations
- Maximise bearing life
- Improve life of kiln supporting rollers and tyres

Our resurfacing services correct these problems without requiring costly kiln stops. We resurface the worn faces of support rollers and tyres in-situ, while the kiln is in normal production, enabling you to improve kiln health without disrupting productivity. It's a win-win.

Resurface before you have to replace

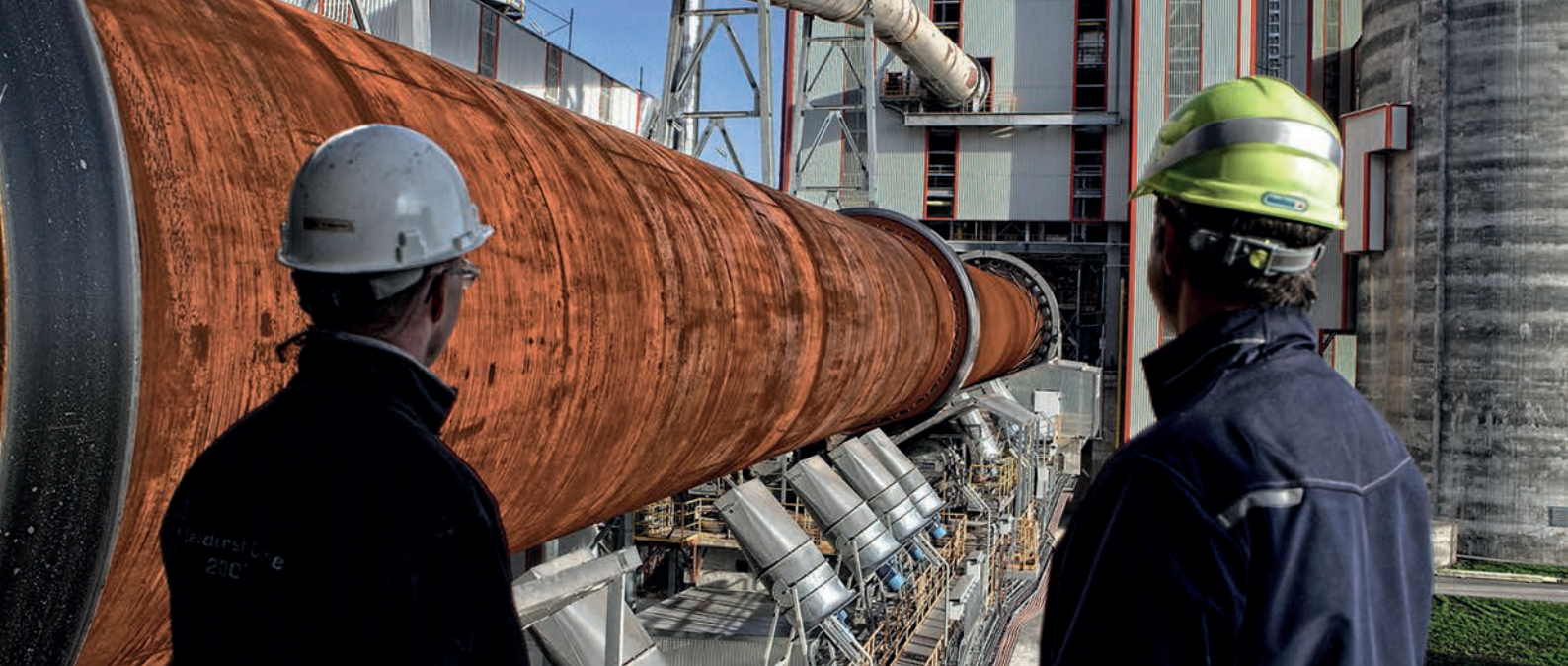
Resurfacing restores the rolling surfaces of tyres and support rollers, extending their life and reducing your overall costs.

As pioneers of this process, we have extensive experience in its application as well as specially designed machines that accommodate different face widths of tyres and rollers.

Regular preventive resurfacing helps you avoid wear issues, including:

- Unwanted vibrations
- Inability to control axial thrust
- Increased power consumption
- Alignment problems
- Reduced bearing life
- Damage to bases, kiln drive and tyre-retaining components

Our resurfacing process allows for corrective adjustment of support rollers, which improves mechanical stability, reduces energy consumption and lowers operating costs. Our service specialists are highly trained in kiln maintenance and will perform any required support roller adjustments to compensate for the removal of material.



ECS/CEMSCANNER™ PREVENTIVE MAINTENANCE SERVICES

Ensure the accuracy of your critical monitoring equipment

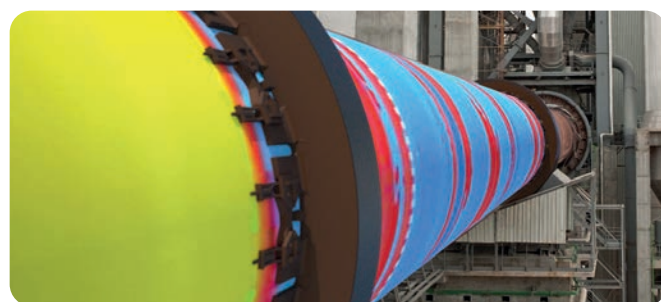
Your ECS™ kiln shell monitoring system can save you from costly and debilitating kiln damage – but only if it is working properly.

You rely on accurate results

CemScanner™ uses a state-of-the-art infrared scanner to monitor kiln shell temperature and tyre slip. These measurements are critical to detect the early warning signs of damage, but uncalibrated equipment – or even something as seemingly minor as a dirty lens – can undermine performance, leaving you with inaccurate figures and a false sense of security. Unfortunately, there is no replica for CemScanner performance. Even checking the validity of measurements with a handheld pyrometer won't give you an accurate reading, which is why we have developed a preventive maintenance programme for the ECS/CemScanner.

Key benefits

- Detect kiln shell hot spots
- Prevent catastrophic kiln damage
- Monitor tyre slip



Our preventive maintenance services ensure your ECS/CemScanner™ is taken care of. As part of your annual maintenance service we will visit your plant and carry out a comprehensive check on the equipment, including:

- Calibrate scanner head.
- Check and correct scanner alignment.
- Replace filters, clean window, and cabinet.
- Check electrical and network connections.
- Review available software service packs and hot fixes and install as necessary.
- Complete review of the operating condition of the complete system (servers, clients, network) to find current or potential problems.
- Review alarm and event logs.
- Windows event and performance logs.
- Network monitoring.
- Security vulnerability analysis.
- Review with engineers and operators the current functionality for bugs, and areas that need improvement.
- Improve and enhance the system as necessary to ensure the system is meeting the user needs.
- Review alarm and event logs and take corrective action as necessary.
- Check system configuration.
- Customer Training

Additional services are also available, such as implementing automated kiln shell cooling fan control, and enabling your CemScanner to communicate with your data historian and analytics systems.



ONLINE CONDITION MONITORING SERVICES FOR KILNS

Predict maintenance and maximise plant productivity

A sensor package and a datalogger are connected to our Global Remote Service Centre team, who monitor the status, analyse the data, and deliver regular reports and quick resolutions for critical issues affecting kiln health.

This service helps detect early symptoms that can't be detected by regular on-site maintenance alone. It's a complement to on-site maintenance services, such as hot kiln alignment.

Our kiln specialists interpret the data and give you valuable recommendations and solutions to achieve optimum kiln reliability and health.

With Level I service, we monitor:

- Bearings
- Hydraulic thrust devices
- Kiln drives
- Possibility for ECS/CemScanner® integration

With Level II service, we monitor all of the above plus:

- Kiln crank
- Kiln shell ovality
- Kiln drive vibration
- Axial balance.

This service applies to both Fuller kilns and kilns from other OEMs.

- **What?** Continuous kiln health monitoring and incident support; regular reports summarising alarms and recommendations; clear, actionable insights that you can implement.
- **Outcome:** You can predict failures that are not possible to detect with on-site preventive maintenance alone. You can therefore take timely action to optimise performance and significantly reduce the risk of kiln failure.
- **Reference case:** This service identified kiln axial floating instability. Using this data, our experts did a root cause analysis, suggesting a hydraulic leak was to blame – the result of a defective valve. This kind of defect is virtually impossible to identify without the condition monitoring service and would ultimately have resulted in costly, unscheduled downtime.

This service complements the on-site Hot Kiln Alignments. When these are done together in a bundle with specific engineered parts, we are able to offer extended warranty on the parts.



FIRST-TIME SERVICE AGREEMENTS FOR NEW KILNS & KEY KILN COMPONENTS

Maximise availability and reduce your operating costs with a service agreement on Fuller kilns and key kiln components

Maximise your ROI

The purchase of a kiln or engineered part is an investment in the future of your plant. To make sure that you get the most from this investment, we provide service agreements that significantly extend the lifetime of key kiln components, reducing the total cost of ownership of your equipment, and increasing your kiln reliability and performance.

Extended warranty on key components

Our first-time service agreements give you an extended warranty on key kiln parts, helping you save costs on repairs and eliminate the risk of long lead times and associated downtime. This applies to key components purchased with new kilns or replaced on installed kilns.

Key benefits

- Extend your warranty on key components
- Increase kiln availability
- Cut maintenance costs
- Increase ROI and reduce total cost of ownership
- Receive the advice you need to optimise kiln maintenance
- Upskill your operators

4
YEARS
WARRANTY

With on-site services covering two hot kiln alignments

6
YEARS
WARRANTY

With on-site services covering two hot kiln alignments, and online condition monitoring services

The service agreements are structured as yearly subscriptions, making it easy to include in your plant budget

Preventive maintenance and predictive analytics to increase kiln reliability

Online condition monitoring services enable you to avoid critical failures on your kiln and its key components, thereby reducing unexpected downtime of some of your most critical equipment. The service also includes expert insights that were previously unavailable, based on which you can optimise the timing and frequency of Hot Kiln Alignments. The online and on-site services complement each other to optimise your maintenance activities and reduce operating costs. And, even better, your team receives expert knowledge and maintenance advice from our experienced technicians, equipping them to run the kiln and its components at optimum performance levels.

Kiln components with extended warranty

For 2- and 3-base kiln:

- supporting roller
- live ring
- thrust roller
- tangential suspension

For 3-base kiln:

- supporting blocks
- girth gear*

*For girth gear, extension of warranty is available only with Hot Kiln Alignment and online condition monitoring services (extending warranty to 6 years)



We work with you to identify and eliminate root causes, helping you avoid:

- Clinker fall-through
- Red rivers
- Excessive wear on the grate line and under-grate compartments
- Hydraulic system issues
- Reduced heat recuperation

COOLER INSPECTION SERVICE

Increase cooler availability

Cooler inspections

Regular preventive inspections can eliminate many of the root causes of excessive wear. An on-site inspection by Fuller provides a complete evaluation of your cooler.

Since a problem detected in one area can have its root cause in another, we use the latest fault-finding technologies to analyse each individual element in depth and understand the true origins of the problem. Each individual element is given a comprehensive analysis.

Cooler installation and repair services

To help you maintain high cooler availability, we support with installation, technical advisory on and alignment of all equipment parts, from linear bearings, drives and cylinders to frames and the fixed inlet.

INSPECTION CONTENT		
During production	<ul style="list-style-type: none"> Hydraulic oil sample analysis and on-site particle counting Data logging of pressures and behaviour of hydraulics Operation parameters collection and optimising 	<ul style="list-style-type: none"> Under grate compartment air flow analysis Visual inspection of grate compartment Root cause analysis of control panel alarm history
Hydraulic system	<ul style="list-style-type: none"> Adjustment/control of parameters for hydraulic unit Offset adjustment of hydraulic pumps Control and adjustment of nitrogen bladders On-site particle counting of system oil 	<ul style="list-style-type: none"> Inspection of piping and valves connections Functioning test and alignment of hydraulic cylinders Supervision of hydraulic component overhaul
Inlet	<ul style="list-style-type: none"> Control and adjustment of temperature transmitters Control and adjustment of airblaster system Functionality check mechanical flow regulators 	<ul style="list-style-type: none"> Check drive plates and sealings Functionality and cleanliness of air distribution plates
Grate line	<ul style="list-style-type: none"> Control of retainer brackets Wear analysis of moveable/stationary Cross-Bars Wear and clearance check of U- and C-profile 	<ul style="list-style-type: none"> Air distribution plates and grate protection plates
Under grate compartment	<ul style="list-style-type: none"> Hydraulic cylinders, brackets and cleave pins control Alignment check and adjustment of moveable frame Functionality check of mechanical flow regulators 	<ul style="list-style-type: none"> Wear analysis of linear bearings Check intermodular straps and sealings Adjust length of transducers/ drive profiles Control and adjust temperature transmitters Functionality check of lubrication system
Crusher/ HRB	<ul style="list-style-type: none"> Control and adjust alignment Visual inspection and clearance check of key components 	<ul style="list-style-type: none"> Visual inspection and alignment check of grizzly bar
Recommended cooler inspection frequency: Every year		



COOLER OPTIMISATION SOLUTIONS

Increase cooler throughput
and enhance efficiency

Improved cooler operation will help you decrease your operating costs, reduce the cooler's total cost of ownership, and ensure that you can operate your equipment in a sustainable way. Our cooler optimisation services include upgrades and overhauls to optimise heat recuperation, improve air distribution and reduce your fuel requirements.

Overhaul of hydraulics

To get the best possible performance from your hydraulic components, we offer:

- Overhaul of your hydraulic pumps and cylinders by specialists
- Site flushing of hydraulic systems to ensure maximum lifetime of the system
- Upgrades to the latest instrumentation design for better thermal protection.

When you need to increase the cooler's throughput and efficiency, eliminate bottlenecks or reduce your operating costs, we can help you with a range of upgrade solutions, such as:

- Installation of fixed ABC™ inlets to eliminate snowman formation
- Fixed inlet upgrade (CIS to ABC™)
- SF™ to Cross-Bar® cooler upgrade for improved transport efficiency
- Cooler extensions to increase capacity
- Upgrades of cooler control system
- Overhaul and upgrades of crusher and hydraulic roller breaker
- Full refurbishment of hydraulic cylinders and pumps
- Fan upgrades for improved operation and lower power consumption
- Grate plate upgrade (wave grate) for reduced fan power consumption or increased air flow and reduction in wear parts

Cooler start-up and optimisation

After a complete cooler overhaul, we can stay on site to optimise operational parameters during start-up and ensure sustainable performance in the long-term.

We can support with:

- Review of cooler controls and interlocks, to ensure the correct clinker layer and cooler operation, and thereby the highest cooler efficiency.
- Recommendations for correct operational procedures during startup, shutdown, and upsets, which are essential for the protection of mechanical parts, extending their lifetime and reducing your operational costs.
- Control and adjustments of air flows, optimisation of air distribution and clinker chemistry, to get the right clinker nodule size changes when using alternative fuels or petcoke.



ONLINE CONDITION MONITORING SERVICES FOR CROSS-BAR® COOLERS

Improve cooler reliability and extend cooler lifetime

Data is sent to our Global Remote Service Centre team via a secure connection. It is analysed by our specially-developed algorithm, with any abnormal results going directly to our experts for further analysis and investigation. The Global Remote Service Centre team will report immediately on critical issues and will also provide regular reports on the condition of your cooler.

An easy add-on with widespread impact

No special instrumentation is required – we simply connect to your existing cooler data via a datalogger and PC (provided as part of your subscription), and then we can keep an eye on the health of your Cross-Bar® cooler.

Data is sent to our Global Remote Service Centre team via a secure connection and analysed by our specially-developed algorithm, with any abnormal results going directly to our experts. The Global Remote Service Centre team will report immediately on critical issues and will also provide regular reports on the condition of your cooler.

Catch problems before they escalate

Our experts have the experience to interpret the data, report critical events and provide recommendations and solutions to help you optimise cooler reliability and performance.

Life-saving services

The main KPI of any cement plant is to continuously operate the kiln and cooler system >330 days/year. When we're talking about equipment as critical as the Cross-Bar cooler, it's no exaggeration to say that a prompt response to cooler asset health issues and maintenance issue can save millions.

What's included?

A 1-year subscription to our online condition monitoring services for Cross-Bar coolers includes:

- Data logger and PC with secure connection to our Global Remote Service Centre
- Continuous health monitoring and incident support
- Regular reports summarising alarms and recommendations
- Clear, actionable insights that will improve cooler reliability and performance

What's monitored?

With this package, we monitor the condition of your:

- Cooler hydraulic system, to evaluate the health and abnormalities of hydraulic pumps, cylinder seals and critical components by analysing:
 - Hydraulic drive force
 - Hydraulic pump utilisation factor
- ABC inlet and Cooler fans, to ensure the long lifetime of wear parts and cooler health by analysing:
 - Recuperation zone cooling air coefficient and pressure drop coefficient
- Heavy-duty Roller Breaker (HRB), to monitor abnormalities and HRB health by analysing:
 - Roller torque, reversing frequency and bearing temperature



GAS ANALYSIS SYSTEM SERVICES

Maximum uptime through reliable process monitoring

INSPECTION CONTENT		
Probe system	<ul style="list-style-type: none"> Filter and O-rings Set points Cooling system 	<ul style="list-style-type: none"> Probe cleaning system
Gas conditioning system	<ul style="list-style-type: none"> Sample lines Filters Cooler functionality Solenoid valves Pumps 	<ul style="list-style-type: none"> Test gas and connections Parameter setup at HIMI Cabinet cleaning
Analysers	<ul style="list-style-type: none"> Zero and span check Linearity check Complete analyser 	<ul style="list-style-type: none"> check inc. sample cell
Leak test	<ul style="list-style-type: none"> Leak test of complete system from probe tip to analyser 	
Dust monitors	<ul style="list-style-type: none"> Sender / receiver unit Cleaning of glasses Purge air unit Zero and span check 	<ul style="list-style-type: none"> Linearity check Cleaning of dust monitor
Recommended inspection frequency: Every year		

Gas analysis system services are an essential element of production. Regular maintenance of your gas analysis systems helps you reduce system downtime and optimise plant performance.

We provide expert maintenance and repair services to help keep your gas analysis system in safe and stable working order.

Preventive maintenance

Our range of preventive services can decrease the likelihood of breakdown and reduce uncertainty. By planning timely onsite service visits and making use of our online performance and asset health reports, you can increase your equipment's life expectancy and enjoy predictable maintenance costs.

Emergency support

Gas analysis systems are complex, so it's essential that you get expert assistance when problems occur. Our service technicians are highly skilled and offer both remote troubleshooting and onsite support.

Our webshop airloq.Fuller.com has an extensive inventory in wear and spare parts and can often deliver within a few days. When needed, we repair and support all the most common gas analyser brands in our own specialised workshop, where we carry a full range of spares for brands including ABB®, Siemens®, Emerson®, Durag® and NEO™. The turn around time for repairs is maximum 12 days after we have received the analyser.

Upgrades

We can refurbish and upgrade analyser systems of any brand, resulting in:

- Reduced maintenance time
- A run factor greater than 95%
- Powerful probe cleaning
- Reduced fuel costs
- Fewer production stoppages



PACKING AND DISPATCHING EQUIPMENT SERVICES

Ensure high-quality and reliable delivery of your product

Packing and dispatching machinery plays a vital part in maintaining production flow. In addition to spare parts, Fuller provides engineering and testing services to help your equipment achieve maximum performance and durability.

To ensure correct installation and reliability of your equipment and parts, we support installation and upgrades of everything from mechanical parts through to electrical systems and power supplies, as well as process control and control systems.

We work with you to identify and eliminate root causes, meaning you avoid:

- Burst bags due to overfilling
- Double revolution filling
- Loss of bags during loading
- Product spillage during filling
- PLC, HMI and electrical failures
- Mechanical and pneumatic failures



INSPECTION CONTENT

Rotary packer	<ul style="list-style-type: none"> ▪ Calibration of weighing units ▪ Test and control of pneumatic system ▪ Mechanical functionality test ▪ Control and adjustment of electrical systems 	<ul style="list-style-type: none"> ▪ Wear check of critical parts ▪ Instrumentation check-up ▪ General fine-tuning of the equipment
Automatic bag applicator	<ul style="list-style-type: none"> ▪ Set-up of the equipment ▪ Test and control of mechanical parts ▪ Electronic cam functionality test 	<ul style="list-style-type: none"> ▪ Test and adjustment of local PLC and HMI ▪ Synchro testing/tuning
Palletiser	<ul style="list-style-type: none"> ▪ I/O full testing ▪ Test and control of electro-mechanical part ▪ Encoders functionality test ▪ Test and adjustment of local PLC and HMI 	<ul style="list-style-type: none"> ▪ Fine-tuning during operation ▪ Advanced troubleshooting
Automatic truck loaders and bag handling	<ul style="list-style-type: none"> ▪ Calibration of truck loading system ▪ Test and control of hydraulics ▪ Mechanical functionality test 	<ul style="list-style-type: none"> ▪ Test and adjustment of parameters in control device ▪ Fine-tuning ▪ Operation overview

Recommended inspection frequency: **Every year**



MAINTENANCE OPTIMISATION

Fuller's approach to plant optimization includes maintenance support, from a complete assessment of the equipment and processes involved, to the development of a comprehensive plan to boost reliability including Customized Preventive and RCM methodologies, mentoring, and resources development, Fuller can be a committed partner to improve your plant operations.



The focus of maintenance in a cement plant is to optimize the equipment reliability, this is at the center of Fuller service offerings.

Diagnose: Maintenance Assessment.

Establishing a baseline to understand gaps and improvement opportunities to increase plant reliability.

- Equipment status.
- Maintenance Process review.
- Resources review.
- External influences.
- Conclusions and recommendations.

Improve: Action Plan Implementation.

Implementation of the conclusions and recommendations to increase the plant reliability in short and medium terms.

- PM / RCM Maintenance Strategy implementation / update.
- Digital Inspections.
- Maintenance Mentoring.
- Talent Training.
- Performance reviews / KPIs.

Key Benefits of Maintenance Support from Fuller.

- Increase reliability.
- Reduce maintenance costs.
- Move from a reactive to a proactive maintenance culture.

Stabilize.

Implementation of actions to sustain the plant performed achieved and to improve on the points that are mid to long term timing.

- Online Conditioning Monitoring.
- Remote support / KPIs review.
- Long term Development Programs.
- On-demand onsite support for specific and critical activities.

4th Generation

Predictive Maintenance
Smart instrumentation and OCMS
Cloud capabilities

3rd Generation

Reliability-based maintenance
FMEA
Safety & Environmental

2nd Generation

Preventive/ Planned Maintenance
Time-based [age] planning, failure probability

1st Generation

Reactive Maintenance
Fix it when it brakes, "Run to failure" strategy.

Reliability Centered Maintenance.

- Reliability centered maintenance (RCM) is a strategy that prioritizes plant uptime with the goal of achieving maximum productivity, improved safety, and ultimate cost-efficiency. We start by looking at the whole plant, assessing which assets are most important to plant operation.
- We then develop maintenance strategies for each of these assets based on our understanding of the risk and the type of maintenance needed to keep it operational and operating cost-effectively.



INSTALLATION SERVICES

Maximise the value of new equipment with our installation services

Take the stress out of your installation project

The installation of new equipment components is a time of high risk. You're working to tight deadlines, often in limited space, with high-value machinery. It's stressful and disruptive – made even more so if you don't have the expertise on staff to ensure that the installation meets OEM guidelines. Our expert installation services mitigate that risk, enabling you to minimise downtime and achieve that speedy ROI.

No challenge too great

We offer a broad range of installation services to match your needs, for projects of all types and sizes. Our end-to-end installation solutions enable hassle-free execution from your end.

For example, we helped the Tây Ninh plant in Vietnam replace their kiln live ring in just 11 days during a global pandemic. And we were the first choice to assist Nuh Cimento, Turkey, with a very challenging installation project comprising 14 kiln shell sections – a project that began less than one month after the contract was signed.

Our extensive experience and the range of services we offer makes us the ideal technical partner for complex and critical projects across all regions.



Full-service solutions

Our comprehensive installation services cover the complete project, from beginning to end. Take, for example, a kiln or mill installation project. Your service would include:

- Delivery and replacement of kiln sections, tyres and supporting rollers, girth gears, pinions, mill shells, trunnions, diaphragms and gears
- Maintenance and replacement of kiln and mill inlets, and outlet sections and seals
- Replacement, reversal and alignment of girth gear, pinion and drives

Dedicated project management

Throughout the project, you will have a dedicated point of contact backed by our global network of experts. This project manager will understand your plant and the equipment and can help streamline all communication and coordinate with any subcontractors. This makes the whole process more efficient, saving you time and money.

Key benefits

- Get new installations up and running safely, quickly and efficiently
- Experience shorter shutdowns
- Mitigate risks and enjoy greater peace of mind
- Get tailored, expert support from start to finish



BASELINE AUDIT

Get a snapshot of your site operations & gain understanding where opportunities are to tap into your true site's potential.

Whether you have just acquired an existent Cement Plant, changed management, or your company has taken a methodical structured approach to monitor and engage in continuous improvement philosophy of work, a baseline audit offers a sound solution to support you on your journey towards operational excellence.

Conducting a Comprehensive assessment over the equipment, the standard operating procedures in place and alignment to their actual execution, as well as looking into the organizational structure and knowledge base among your site team, will allow the identification of clear opportunities to bring your operations to a different level. Findings such as identifying non-existent procedures and routines, needs for training on a particular subject or fine tune your maintenance strategy, the baseline audit can help you draw a road map to take you from your existent condition up to optimum utilization of your assets.

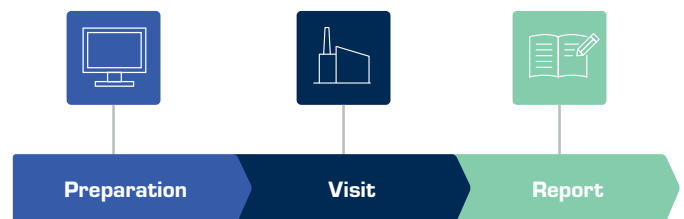
The Baseline Audits are part of the Asset Management Service portfolio.

What's in it for you?

Key Benefits

- Obtain a snapshot of your plant overall performance and condition (from equipment, procedures and organization perspectives).
- Receive insight on where opportunities are to close the GAP between where your plant is and where is it that it could be [based on installed technology, age, operational context].
- Foundational work to explore the use of more comprehensive services from Fuller.

How it works?



The Baseline Audit has three stages: Preparation, Visit and Report.

PREPARATION This stage is conducted remotely, in which you as our customer submit the relevant information which our team of specialist will process to gain an initial understanding and plan the points in which the team will focus their effort as they conduct the second stage – the Visit.

VISIT On this stage the team of experts is deployed to your site to conduct the relevant inspections and interviews which will help them complete their understanding of the current site conditions as well as identify the opportunities for improvement.

REPORT On this stage the team shall capture the essence of the information that was processed, address the potential, and sketch a roadmap of what needs to be done to close the performance GAP.

Peter Drucker once said ***“What gets measured gets managed” – Knowing where you are and the potential of where you could be, will provide you the required Clarity to do what is needed.***



LABORATORY AUDITS

Expertise and knowhow that evaluates the performance of your laboratory

Why audit your lab?

The purpose of a laboratory audit is to analyse and ensure your laboratory measuring system is capable of measuring the process and cement quality with sufficient accuracy.

The accuracy and precision of the chemical and physical analysis in a cement plant are key to guarantee supply of products that comply with standards and take the right operational decisions.

Reliable laboratory data is a prerequisite for maximising clinker quality, reducing the clinker factor in blended cement for a given performance and supplying cement of consistent quality to your customers.

Our audits cover all the relevant analyses in the lab, including both chemical and physical tests. Once complete, we will confirm the accuracy of your data. We'll also let you know where there is scope for improvement to your operations and quality for clinker and cement.

The performance targets for the laboratory measuring system are based on parameters identified by the manufacturing quality targets. The targets may differ from cement plant to cement plant, but will typically include XRF analysis, cement strengths, initial setting time, water demand, fineness and SO_3 content.

Key benefits

- Ensure more precise and accurate data
- Make informed decisions on how to optimise your process
- Increase efficiency across the plant

Our comprehensive process knowhow enables us to look at your lab as part of your wider plant process.

Step 1 We'll cross-check your samples in our state-of-the-art laboratory

Step 2 We'll evaluate laboratory processes and equipment performance

Step 3 You'll receive a report on our findings including recommendations for improvements

Your audit will be tailored to your plant, your lab setup and any particular concerns you may have.

We'll also assist you with knowhow to improve both short-term and long-term variations for clinker and cement and benchmark results from your plant within the guidelines for EN196-2 and best practice targets for optimum clinker quality and cement performance.

Knowledge is power

The more you know, the greater your ability to improve your plant performance – and profitability. With better efficiency and a streamlined process, you can improve productivity and lower operating costs. Tighter control on the process will also increase process and quality consistency and stability, which has a positive effect on other energy-saving initiatives around the plant.



ONLINE CONDITION MONITORING SERVICES

Spot the earliest signs of failure
and take effective action

Benefits

- Minimise unplanned stoppages and secondary damage to equipment
- Increase equipment lifetime, reliability, and performance
- Lower OPEX
- Achieve more sustainable operations

Continuous online monitoring by our team of experts provides:

- Event reports on critical alarms – 24/7 incident support and remote assistance lets you take immediate action to avoid failure.
- Periodic asset health reports with recommendations – insights to significantly improve equipment health and lower operating costs.
- Ability to carry out predictive maintenance – enabling you to take action that is not possible with on-site preventive maintenance alone.
- Online access to plant performance data – the SiteConnect™ app provides real-time visibility of equipment performance, anytime, anywhere.

This means you can plan the right maintenance tasks at the right time, maximising uptime and minimising costs.

What are online condition monitoring services?

We currently offer online condition monitoring services for equipment within crushing, grinding, pyro, gear and drives and many other technologies. The service connects your machines to our experts. Sensors 'read' the equipment and send data about its health to our cloud-based monitoring system. Data can be captured from existing sensors (Level I service), or, when further accuracy is needed, our specialists can install additional sensors (Level II service).

But it's what you do with the data that's important. In our Global Remote Service Centre, we analyse, filter and interpret the data, using our experience combined with AI and machine learning to add context to the numbers

Online condition monitoring services help you succeed with industry challenges such as safety, quality, productivity and protecting the environment.

This service helps identify early symptoms that can't be detected by regular on-site preventive maintenance alone. It's a complement to on-site maintenance and helps you plan your next maintenance overhaul, while optimising production and costs.



ASSET MANAGEMENT

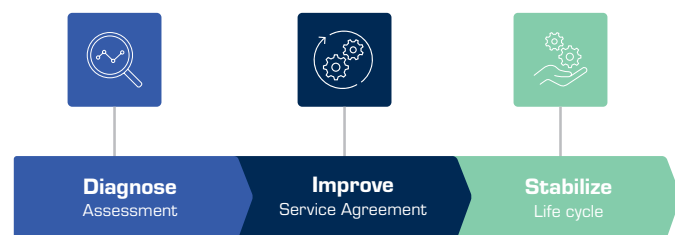
Optimize your plant's performance to meet your reliability and sustainability targets.

Maybe you want to achieve higher equipment availability, or you have changed the production process and need to finetune the equipment; perhaps you have made recent upgrades and need to upskill your on-site personnel; or you would like to improve efficiency and productivity, for example, reducing power consumption or increasing the performance factor of your assets.

In any case, we work with you to build the best service bundle that will help you achieve the improvements you are targeting. The Asset Management service solution can be applied to one part of the plant or discipline or to cover the entire process and can be built with a mix of onsite and remote support to suit your needs.

How it works?

The Asset Management Services makes use of the capabilities, knowledge and experience that Fuller has built over the years providing services that conform the following process:



Key Benefits

- Improve equipment and plant performance.
- Increase productivity.
- Gain insight and implement World Best Practices.
- Reduce operating cost.
- Upskill your personnel and achieve lasting change.
- Reduce power consumption and CO2 emissions.

On this catalog you will learn of the different services that Fuller provides: Baseline Audit, Remote Support, Onsite Support, Productivity tools, OCMS, Training & development, Maintenance strategies; are among the services that we can bundle to suit your needs in a more comprehensive manner.

It is through understanding your plant's needs and its operational context that we mix and bundle the services that Fuller has developed to provide you a robust solution to help you accelerate your business strategy implementation.

What's in it for you?

- Minimal Environmental impact (CO2 emissions, etc)
- High Productivity
- High Quality
- Safe operation – Zero accidents
- Continuous Improvement
- Max equipment utilization
- Max equipment throughput
- Minimal electricity consumption, calorific consumption
- Extended equipment lifetime



PLANTLINE™ AGREEMENT

24/7 support for your process and quality control systems

Your site relies on digital ecosystems to maximise productivity, efficiency, and quality. But what would you do if these systems failed? A PlantLine™ Service Agreement ensures our experts are always there to deliver timely, customised support via our 24-hour hotline, digital remote support tools and on-site service visits.

Our process experts, at your service

Problems with your process and quality control systems can leave you with huge costs, lost production time and a whole lot of stress.

The PlantLine™ Agreement is a service concept designed to ensure you never face these challenges alone. It's a modular offering, available across all your Fuller automation, process, and quality control systems on a subscription basis (annual or multi-year).

At its core, the PlantLine™ Agreement is designed to bring you closer to our network of automation experts, giving you the support and resources you need to improve reliability, efficiency, and productivity.

The core components of a PlantLine Agreement for a prepaid fixed price:

- 24/7 unlimited remote support on system use
- 24/7 unlimited remote support to troubleshoot system problems
- Installation of available software updates on version
- Support for re-establishment of a system
- Antivirus with tested updates
- Ability to monitor plant data through SiteConnect™ App
- Dedicated Fuller service manager
- Additional modules can be added to enhance your cybersecurity and system maintenance.

How PlantLine™ benefits you

Sometimes it's difficult to put a monetary value on service, but you will see the impact on your bottom line when you improve your plant's reliability, capacity, efficiency, and longevity with PlantLine™.

Key benefits

- Timely and fast remote support
- 24/7 connection to a network of experts
- Cost-effective service plan

From the very first steps

Our expertise extends beyond troubleshooting. We're here from the very beginning, with the capability to assist with start-up and commissioning from our Global remote service centre. From the quarry, right through to dispatch, we can implement remote access to your equipment/ plant for continuous monitoring, enabling you to achieve maximum performance levels with the highest availability.

Our remote operational advisory and mentoring will enable you to reduce meantime between failure, cut costs and increase productivity. In addition, our experience and know-how in operating and maintaining cement equipment will enable you to increase alternative fuel utilisation, reduce energy consumption, achieve your environmental targets, and improve product quality and keep a high level of knowledge across your team.

What training do you need?

We offer practical training for all plant equipment and systems – from any manufacturer. Choose from our listed training courses or let us know what you need, and we will develop a course specifically for you.

Key systems covered by the PlantLine agreement:

- Pfister feeding and dosing
- ECS/ControlCenter™, used in
 - ECS™ Process Control Solution
 - ECS™ Machine Control Solution
 - ECS™ Product Control Solution
- ECS/UpTimeGo™
- ECS/ProcessExpert™
- ECS/PlantDataManagement™
- ECS/CementScanner™
- QCX/BlendExpert™
- QCX/Robolab™
- QCX/Autosampling™
- BulkExpert™
- Gas Analysis & Emission Monitoring



PROCESS AUDITS

Unlock the potential of your cement plant with expert insight and advice

Key benefits

- Improve plant performance
- Increase energy efficiency
- Reduce emissions
- Increase productivity

Why audit?

Audits are an essential component of any process improvement project. Working closely with you, we use a combination of on-site inspections and data collection to give you a comprehensive picture of current plant performance and identify areas for improvement. Our range of services includes full plant audits, individual process audits, and sustainability audits that look at areas such as energy efficiency and alternative fuel utilisation. All audits include a final report of our findings and recommendations.

Comprehensive plant audits

This full-flowsheet audit looks at everything from the quarry to dispatch, inspecting all processes and production methods to give you a complete picture of plant performance and potential. The audit combines the Raw Meal Grinding Audit, Fuel Grinding Audit, Pyro Process Audit, and Cement Grinding Audit, typically also with a Mechanical Equipment Condition Audit or Special Focused Audit – all depending on your specific needs.

This audit will help you identify ways to improve product quality and consistency, equipment availability, maintenance practices, efficiency, and more.

Grinding audits

A grinding audit enables you to establish where you are losing efficiency in your grinding process, and how it can be improved. In addition to energy consumption, our audit looks at production capacity, fineness, wear, drying and separator efficiency.

Pyro audits

Evaluate the performance of your preheater, kiln and cooler with a pyro audit. Here, we analyse kiln conditions, fuel and energy consumption, and look at the burner and cooler set-up to check on efficiency, stability and overall performance. We're specifically looking for ways to help you reduce power and heat consumption, as well as solve any process bottlenecks or challenges.

Sustainability audits

If you would like to improve the sustainability of your process, a sustainability audit is a great starting point. We can tailor these audits to your process goals, with services such as:

- Fuel substitution audit - review and study energy contribution, fuel handling, bypass, final product and raw mix adjustment.
- Emissions audit - review and study emissions from the stack.
- SNCR audit - evaluate the operation and performance of the SNCR system.



TECHNICAL MANAGEMENT

Reach the top of your game with a world class management team

The technical management solution is the most comprehensive service solution that we offer, incorporating a number of capabilities within Fuller to secure the best possible results in terms of your plant's performance.

We deploy a strong team of experienced professionals to work on the site, as well as management systems, digital tools and standard operating procedures that enable your plant to thrive. All backed by more than 140 years' experience in the cement industry.

Key benefits

- Your plant is managed efficiently, in line with market demands
- You see KPI-driven results – reliability, optimisation and sustainability
- Upskill your workforce
- Achieve ambitious sustainability and efficiency targets



The technical management team covers the disciplines of Safety & Environment, Production, Reliability, Maintenance (Electrical, Automation, Mechanical), quality control and procurement to bring the best out of your cement plant or grinding facility so you can focus on what really matters: growing your business.

The technical management solution can also integrate into its scope the supply of the relevant spare parts and consumables, simplifying your internal procurement processes and optimising your supply chain.

Depending on your customised scope, this service can also include guarantees: such as volume of production, electrical power consumption and fuel consumption. This not only brings you peace of mind, but also assists with financial planning and gives you greater certainty around your production capabilities.

We bring you technical peace of mind

With our technical management solutions, you can stop worrying about all the complexities and problems surrounding operating and maintaining your cement plant and let us take care of it. That frees you up to focus on core activities, while knowing that your team – backed by experts – will get the best results.



TRAINING & DEVELOPMENT

An investment in people is an investment in sustainable productivity

Around the world, skills shortages are preventing cement plants from achieving their true potential. Training can make all the difference.

Upskilling your team is one of the core pathways to sustainable productivity. With the right skills and knowledge, you can improve plant performance, reduce downtime and increase efficiency. Our training courses can be customised to meet the specific needs of your plant, covering all areas from the crusher to the cement mill.

A valuable investment

Quality training not only improves plant performance, it also increases the confidence, motivation and satisfaction of your team. With improved troubleshooting and maintenance competencies, you reduce the risk of equipment breakdown and improve availability. In short, you put your plant in a better competitive position.

What training do you need?

We offer practical training for all plant equipment and systems – from any manufacturer. Choose from our listed training courses or let us know what you need, and we will develop a course specifically for you.

Key benefits

- Customisable programmes
- Improve productivity
- Reduce downtime
- Increase efficiency



We work with you to determine the best training format and duration to meet your needs and budget, assuring you the highest return on your training investment.

On-site, classroom and online training

You can participate in our training courses online, on-site, or at one of our facilities throughout the world. Our unique, hands-on training is designed to improve your knowledge and plant productivity, from general equipment maintenance and operations, through process controls and system optimisation.

You can access a range of online courses and webinars in various time zones and across many technologies to give you greater access to our global pool of experts.



SERVICE AGREEMENT FOR CALCINED CLAY PLANTS

Get more from your investment with bespoke expert services; custom packages to best match your plant's requirements.



Global OEM support

Through a combination of digital/online and onsite services, training, and spare/wear parts management, we can help you keep reliability high and OPEX low. Though some of the equipment may be new to your operators, we designed it – and can offer full flowsheet support to all aspects of your process.

Optimise production and eliminate bottlenecks

You will have the support of a global network of experts with OEM knowledge and skills to help:

- Optimise calcined clay reactivity and cement quality to maximize substitution rates
- Implement a proactive maintenance strategy, including inventory planning
- Optimize overall equipment efficiency; productivity
- Ensure the efficacy of the colour control technology

Clay testing and feasibility studies

Our purpose-built pilot plant in Dania, Denmark is one of the world's most advanced laboratories for the analysis of materials in cement production. It was reconfigured in 2020 for SCM activation and colour control. Everything you and your customers need to have confidence in product quality.

Service agreement options for calcined clay plants

Online services

- ECS/ProcessExpert® optimization solution
- Online Condition Monitoring (OCMS)*
- Plant Line Agreement
- SiteConnect™ app*
- ECS/UpTimeGo™, Downtime analysis*

Onsite services

- Post commissioning technical service
- Production / maintenance service
- Training
- Services to maximize clinker substitution – and thus achieve CO₂ reduction targets

Spare and wear parts

- First time / 2 years spares and wear package*
- Spares and wear parts stocking plan, and inventory management
- Extended warranty for critical parts*

Simulation, laboratory services

- Process and scenarios simulation
- Laboratory testing and analysis services.

Recommended duration of service package is 2-5 years.

* Digital enablers and sensors hardware included in the calcined clay plant scope

ONSITE SUPPORT

Get technical support where you need it the most – you know your business and know where you need help and direction.

Every business unit through its day-to-day operations is able to notice that on their own setup they can count with a number of strengths and weaknesses. Fuller in an effort to support our clients on their quest for Operational Excellence, has envision Focus Teams to provide the relevant support where our clients need the most.

- Process & Production
- Maintenance & Reliability
- Automation & Reliability
- Core Operation & Maintenance
- Core 360

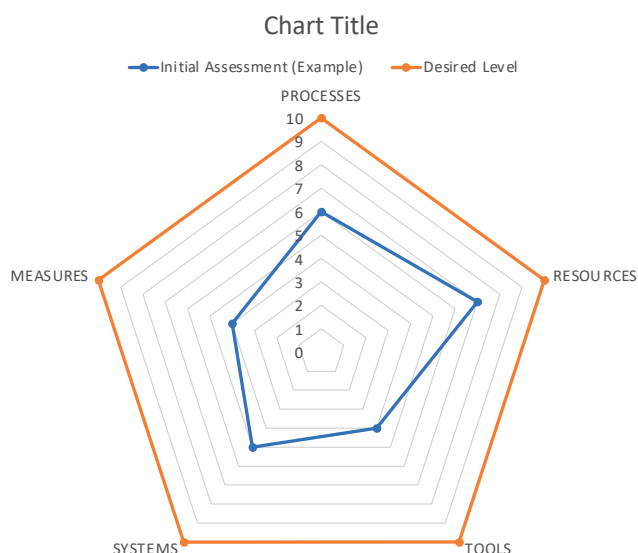
Shared value elements across the teams:

Expertise: Tracked relevant hands-on experience and deep material knowledge as well as the backing support of the Fuller network of experts.

- **Work Methodology:** Conducting an initial assessment and identifying relevant opportunities for improvement and creating a road map to systematically work through to reach the optimal level.
- **Training & Mentoring:** Establishing and facilitating a training programme suited for the key personnel as well as providing relevant mentoring to the department manager/section head.
- **KPI Driven:** Each Focus team works on a KPI driven environment for which the team's actions and initiatives are reflected into tangible benefits for the client.
- **Impact Dimensions:** Each focus team from their line of expertise will work on the improvement of the department on 5 dimensions: Processes, Resources, Tools, Systems and Measures.

How it works?

The selected team will execute its protocol in close collaboration with the client's organization at the plant, starting with an initial assessment to establish the baseline, passing through a number of evaluation stages, identifying required actions to bring the site discipline to a higher performance level.



Key benefits

- Targeted impact
- Enhancement of operating practices
- Opportunity for your team to get on the job training
- High degree of customization

Focus Team	Weeks											
	1	2	3	4	5	6	7	8	9	10	11	12
Plant Assessment	✓	✓										
Standard Operating Procedures Evaluation		✓	✓	✓								
Action Plan Formulation		✓	✓									
Discipline Specific Assessment		✓	✓	✓								
Discipline Specific Action Plan			✓	✓	✓	✓						
Follow up on Action Plan Execution				✓	✓	✓	✓	✓	✓	✓	✓	
Basic Evaluation of Site Personnel competency level							✓	✓	✓	✓	✓	
Final Report												✓

The Fuller team will be able to deliver value on a number of initiatives which will vary from team to team and the set targets and service timeline. Here is a helicopter view of the potential impact for the different focus teams:

Making Impact on	Process & Production	Core Operation & Maintenance	Maintenance & Reliability	Automation & Reliability	Core 360
Cost of Maintenance		✓	✓	✓	✓
Cost of Production	✓	✓			✓
Process Automation				✓	✓
Obsolescence & Retrofit planning				✓	✓
Equipment Efficiency	✓	✓			✓
Standardization	✓	✓	✓	✓	✓
Production monitoring	✓				✓
Production & Asset Health monitoring		✓			✓
Strategy		✓	✓		✓
Planning	✓	✓	✓	✓	✓
Process Audits & troubleshooting	✓	✓			✓
Safe Operating Procedures	✓	✓	✓	✓	✓
Reduction & control of process variability	✓				✓
Asset Integrity	✓	✓	✓	✓	✓
Housekeeping routines	✓	✓			✓
Reporting	✓	✓			✓
Inventory		✓	✓	✓	✓
Root Cause Analysis		✓	✓	✓	✓
Availability of the Assets			✓	✓	✓
Reliability of the Assets			✓	✓	✓
Asset Criticality			✓	✓	✓



CARBON CAPTURE OPTIMISATION SERVICE

Help your plant maximise the success and reduce the cost of carbon capture

Carbon capture technologies are highly energy-intensive. These energy demands – whether thermal or electrical – can double the existing energy consumption of your cement plant. This equates to high ongoing OPEX costs in addition to the high CAPEX costs of installing a carbon capture plant. But there is potential to reduce this energy demand with a few relatively small modifications to your pyroprocess.

Preparing for carbon capture success

Our CCUS optimisation service helps prepare your plant for successful carbon capture. We'll identify the simple, low-risk modifications to your pyro system that can increase the consistency of your gas flow rate and the concentration of CO₂ within the process, so you can reduce the CAPEX and OPEX of a capture plant. At the end of this project, we will outline the site-specific modifications/improvements you can implement for best results. We'll also save the plant model for future reference, so if you decide you want to make further process changes, for example O₂ enrichment, H₂ firing, alternative fuel change, etc. you can evaluate the impact on the process and on your carbon capture plant.

The results of optimisation

After optimisation, the amount of CO₂ to be captured will be the same, but the flue gas CO₂ concentration to the carbon capture unit will increase. This will bring the cost of capture down by 15 – 20%, depending on your specific energy costs – a saving that could equate to millions of dollars. There may also be some savings in CAPEX cost, though these may be offset by the cost of the modifications required at site.

Key benefits

- Prepare for decarbonization
- Maximise the success of carbon capture
- Reduce OPEX costs for carbon capture
- Minimal impact to existing operations

SCOPE OF SUPPLY OF CCUS OPTIMISATION

A feasibility study, including false air audit, cooler balance audit, materials/fuels analysis.

A baseline simulation with scenarios analysis in OneCalc (including modelling of e.g., existing component sealing, low-leakage component upgrades, mill bypass HX implementation, CO₂ transport gas integration, future fuel mix/bypass changes, and related water demand/effluent production).

CO₂ enhancement recommendations for optimal configuration based on the above analysis.

Evaluation and proposal with capture technology providers (as per customer request).

A heat balance assessment and recommendations (primarily plant-side, to maintain heat needed for material/fuel drying, potentially with some integration of reject streams from capture unit).



MATERIAL TESTING SERVICES

Guarantee your investment and improve your process with advanced testing

Specialising in cement production equipment and efficient processes that are fit for the future, our R&D centre Dania in Denmark is the cement industry's largest – a place to test new innovations on a major scale. This is where we carry out analysis of raw materials and process optimisation work.

In the US, our state-of-the-art, world-class pneumatic conveying test facility provides industry-leading support for pneumatic conveying and blending applications.

CLAY TESTING PROCESS

PHASE 1 Physical properties. We use XRF, XRD and thermal analysis to determine the chemical and mineralogical composition of the materials.

PHASE 2 Calcination and emissions testing. We ascertain what – if any – additional measures are necessary to ensure product quality and colour control potential is assessed.

PHASE 3 Final testing. We create a finished cement, carry out strength testing and define optimum process parameters.

Key benefits

- Prove investment potential
- Optimise process parameters
- Guarantee material suitability

Advanced pilot plant and extensive R&D facilities

Cement plant laboratories are capable of carrying out many of the investigations we conduct at our world-class R&D facility – but not all. And of course cement plant laboratories are occupied with the day-to-day work of cement production and can't usually spare the time or resources to conduct additional explorations.

The benefit of outsourcing materials testing to Fuller is that we have extensive resources, experienced staff, and the time to conduct the thorough analysis required before launching into this kind of project.

If you're considering a new investment, or looking for ways to improve your process, make the most of our experience, knowledge, and advanced facilities to ensure you're getting optimal value and the most comprehensive evaluation of possible solutions.



DIGITAL CAPABILITIES AND TOOLS

Our services are powered by digital tools to make better operations and maintenance decisions

Powerful tools to inspire greater productivity

Digitalisation enables cement plant services to be more targeted, more proactive and more successful. We've used our long experience of cement plant equipment and processes to develop digital tools that give you the power to make better operational and maintenance decisions. These subscription-based digital applications are designed to maximise your plant and equipment knowhow – because the more you know, the easier it is to be proactive with your maintenance programme. And that's the key to sustainable productivity.



Benefits:

- Gain data-driven insights to improve your decision-making
- Easily visualise your process data
- Get input and analytics to reduce downtime and increase performance
- Improve consistency of maintenance procedures

Digital subscriptions

ECS/PlantDataManagement collects and stores long term operational and quality data and makes insights available to you via user-friendly dashboards, reports and process analysis tools. This makes it simple for you to track and monitor the performance and health of your plant and to identify opportunities for improvement.

ECS/UptimeGo™ is an advanced downtime analysis software solution that helps reduce unplanned stoppages improves plant availability and reduces production losses. It's an automated analysis software tool for downtime tracking and reporting that gives you the insight you need to identify what causes the equipment to fail and improve processes for the future.

SiteConnect™ mobile app uses IoT technology to give you an easy visual of your operating data in real time. Designed for use on your mobile devices, SiteConnect allows you to check in on your process anytime, and from anywhere. Even better, you can set thresholds and alerts so that you'll always be informed if something unexpected is happening in your process and action is needed.

ECS/ProcessExpert® helps you cut costs and increase production. It's our advanced process control software - and your platform for improved performance. Based on state-of-the-art process optimisation and artificial intelligence technologies, it enables your plant to raise production, reduce costs, and extend equipment life.

Add expertise with our service agreements

By helping you visualise equipment data, our digital subscriptions are a valuable step towards improved reliability and performance. But you can take these insights to the next level by combining your digital subscriptions with our service agreements. Adding expertise to insights, our operational and maintenance support services enable optimised performance that helps you lower operating costs and meet your production and sustainability targets.



REMOTE SUPPORT

Who would have imagined that having somebody watching over your shoulder could bring you peace of mind...

In an effort from Fuller to provide wider access to scarce technical expertise, we have developed this service solution which provides presence and participation of the team of experts to multiple sites across the globe, with the use of the technology developed for this particular purpose. Knowledge is a key driver of efficiency, and being efficient implies reducing/ eliminating waste, and all kind of waste that is eliminated contributes positively to the environment, which is one of the key aims of Fuller – contribute to the green change.

The Remote Support service solution has 3 levels of service delivery: Silver – Gold – Platinum packages. Common to all is the assistance for the Process, Quality, Production and Maintenance & Reliability disciplines, as well as licenses to a business intelligence platform and a performance management platform. The key difference among them resides on the amount of support (man hour allocation) available within the scope of service.

Key Benefits

- Expert Advice within easy reach
- Periodic evaluation of performance and discussion over alternative plans of action
- Access to Digital productivity tools to enable outstanding results

How it works?

The Remote Support team will be composed of field discipline experts aligned to the agreed scope of services and shall conduct the following:

- Review plant performance and analyse KPI trends and prepare technical advice for the Plant Team should there be any deviations from desired targets
- Analyse operational problems being faced by the Plant and in the process create new cases, assign tasks on cases, review cases and offer technical solutions to be implemented by the Plant's personnel to solve the problems.
- Follow-up on tasks assigned by the Plant Team to the Remote Support Team through the Performance Management Platform.
- Prepare periodic reports.
- Take part on weekly meetings between the Remote Support Team and the Plant Team where the weekly operations of the plant are reviewed, agreed action plans are reviewed, open cases are discussed and an operational action plan for coming week is agreed.

What's in it for you?

Improving plant skills by...

- Increasing skillset at site immediately through direct online access to Fuller's pool of specialists
- Increasing the knowledge of the site personnel through specialized classroom training
- Virtually training the site personnel in close, continuous collaboration
- Improving employees on all levels of the plant through on-the-job training by our advisors

Maximizing output by...

- Structured, continuous longterm improvement of all areas of the site
- Defining KPI's following up and benchmarking
- Ensuring plant availability through de-bottlenecking
- Re-commissioning equipment focusing on achieving the most efficient operation

Minimizing risks by...

- Offering performance-based payment models
- Issuing reporting, work lists and shutdown lists with recommendations
- Updating operating procedures to follow newest standards
- Having our direct operator support guide through challenging situations

IMPORTANT Customized Remote Support solutions can be explored to fulfil your particular needs.

SILVER PACKAGE

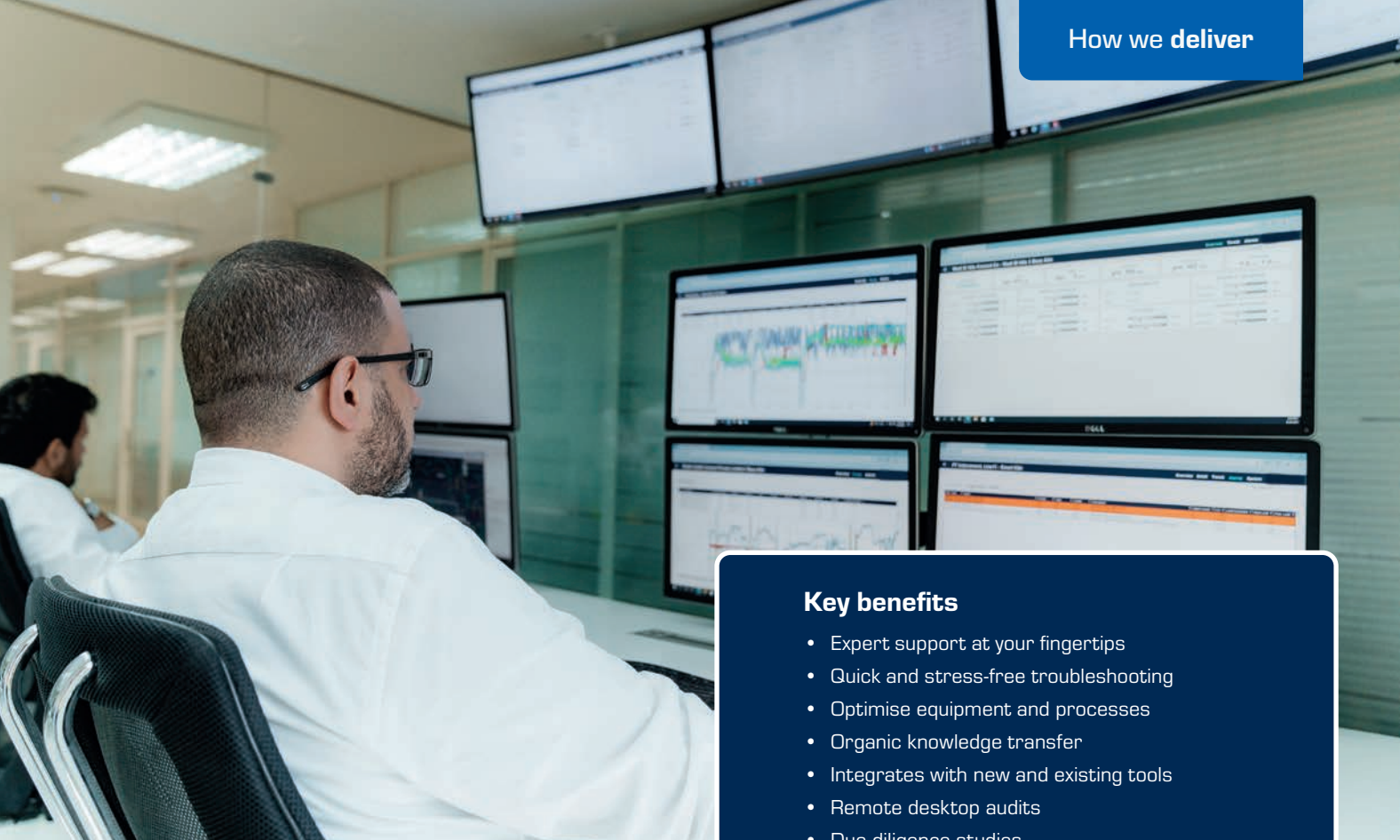
- Daily updated performance Dashboards
- 6h of weekly data analysis by FLS specialists
- 2h of weekly coordination meetings with FLS specialists
- 24/7 Emergency support on demand
- Weekly case reports
- Monthly KPI reports containing improvement recommendations

GOLD PACKAGE

- Daily updated performance Dashboards
- 6h of weekly data analysis by FLS specialists
- 2h of weekly coordination meetings with FLS specialists
- 24/7 Emergency support on demand
- Weekly case reports
- Monthly KPI reports containing improvement recommendations

PLATINUM PACKAGE

- Daily updated performance Dashboards
- 6h of weekly data analysis by FLS specialists
- 2h of weekly coordination meetings with FLS specialists
- 24/7 Emergency support on demand
- Weekly case reports
- Monthly KPI reports containing improvement recommendations



Key benefits

- Expert support at your fingertips
- Quick and stress-free troubleshooting
- Optimise equipment and processes
- Organic knowledge transfer
- Integrates with new and existing tools
- Remote desktop audits
- Due diligence studies

GLOBAL REMOTE SERVICE CENTRE

Our experts will help you increase your plant's efficiency, productivity and availability, wherever you are

The Global remote service centre provides you access to remote support and monitoring, systems implementation, training and constant support from the entire Fuller organisation, quickly and easily. No need to leave the plant or wait for a site visit – we are at your service, by phone, online, and even through AR technology.



From the very first steps

Our expertise extends beyond troubleshooting. We're here from the very beginning, with the capability to assist with start-up and commissioning from our Global remote service centre. From the quarry, right through to dispatch, we can implement remote access to your equipment/ plant for continuous monitoring, enabling you to achieve maximum performance levels with the highest availability.

Digitalised services

Industry 4.0 affords us many opportunities to get to know your plant better – and the more we know, the greater the potential for optimisation. Our Global Remote Service Centre works seamlessly with a range of digital solutions, such as Online condition monitoring services, ECS/ProcessExpert™, QCX Products, ECS CemScanner™, ECS/UpTimeGo™, SiteConnect™, and others, to analyze and optimize your equipment. This enables both easy remote troubleshooting and enhanced process and equipment optimisation.

Advice and guidance

From safety to maintenance to sustainability, our global remote service centre is here to help. With 140 years in the industry, a global network of experts and thousands of references worldwide, we have the experience to provide practical advice and strategy development across your plant.

Our remote operational advisory and mentoring will enable you to reduce meantime between failure, cut costs and increase productivity. In addition, our experience and knowhow in operating and maintaining cement equipment will enable you to increase alternative fuel utilisation, reduce energy consumption, achieve your environmental targets, and improve product quality and keep a high level of knowledge across your team.





FULLER[®]

TECHNOLOGIES



fuller-technologies.com