PeroxiCal™ CALCIUM PEROXIDE | TECHNICAL DATA SHEET | 2026



OXYGENATION + ALKALINITY

1. PRODUCT PROFILE

PeroxiCal™ is a calcium-peroxide-based oxidizer for wastewater treatment and selected remediation applications. Hydrated particles provide a reservoir for oxygen/peroxide release while calcium hydroxide formation contributes alkalinity.

- **Controlled oxygen release**
- **Alkalinity support** (pH)
- **Flexible delivery**

2. PRODUCT DATA

Chemistry	Calcium peroxide (CaO_2)
CAS Number	1305-79-9
Appearance	Fine off-white powder
Forms	Powder or pumpable slurry
Available Oxygen	17 – 18% by weight of powder
Product pH	**11.4 – 11.7** (1% aqueous preparation; OCPE specification)
Powder Bulk Density	55 – 65 lb/ft³ (typical)
Packaging	275-gallon slurry totes; 100-lb powder drums shipped on shrink-wrapped pallets.

Note: Powder assay is not dissolved oxygen concentration. Slurry oxygen content depends on solids concentration. Product pH is not the wastewater operating setpoint.

3. HOW IT WORKS

Water contact activates calcium peroxide. Release kinetics, competing demand and particle retention determine useful oxygen delivery. Alkalinity helps neutralize acidity and manage pH.

STANDALONE VALUE, WITH OPTIONS FOR SYNERGY

Calcium peroxide ranked as the most economical standalone chemical in one comparative sewer-water study. Separate studies support calcium-peroxide co-dosing with nitrate or ferrous iron. See page 6 for conditions and references.

4. APPLICATIONS



Confirm grade-specific COA, current SDS, slurry solids and release profile before design. Drinking-water applications require product-specific suitability and approvals.

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SUSTAINED OXYGEN & ALKALINITY

Design for useful release—not inventory alone.



OXYGENATION

Sustained oxygen supports aerobic processes and can react with reduced contaminants.

ALKALINITY

Calcium hydroxide formation adds acid-neutralizing capacity to help maintain a stable pH.

1 A SOLID RESERVOIR WITH TWO BENEFITS



Hydrated calcium peroxide releases oxygen/peroxide through competing reaction pathways. Calcium hydroxide formation adds acid-neutralizing capacity. Dose, temperature, pH, water chemistry and retained solids govern the release rate.

2 AVAILABLE OXYGEN IS CAPACITY



The 17–18% powder assay describes oxygen inventory. It does not mean 17–18% dissolved oxygen, complete oxygen transfer, or a fixed treatment duration. Useful oxygen is the fraction released at the right location and time.

3 EXTENDED RELEASE: APPLY THE RIGHT CONTEXT



Published data for engineered calcium peroxide report oxygen release beyond 350 days in subsurface remediation. This is not a year-long sewer-performance guarantee. Wastewater demand, hydraulic retention, mixing and solids transport can substantially change persistence.

5 ALKALINITY & DOWNSTREAM SUPPORT



Higher pH favors HS^- over volatile H_2S but does not remove total sulfide. Residual alkalinity may support downstream nitrification; it can be consumed or change form during transport. Nitrification theoretically uses 7.14 mg alkalinity (as $CaCO_3$) per mg ammonia-N oxidized. Verify alkalinity reaching the plant and maintain biomass-compatible pH.

4 THEORETICAL BASIS—PURE CaO_2

Up to 0.222 kg O_2 / kg CaO_2	1.028 kg $Ca(OH)_2$ / kg CaO_2	Up to 1.389 kg alkalinity as $CaCO_3$ / kg CaO_2

Stoichiometric maxima for pure calcium peroxide. Correct for assay and useful recovery; these are not delivered-slurry specifications.

KEEP THE PROCESS BALANCED

- Maintain biomass-compatible pH.
- Check calcium carbonate/phosphate scale.
- Track useful DO and oxygen demand.
- Verify solids retention and downstream transport.

REFERENCES

Wang et al. (2016), DOI 10.1016/j.cej.2016.05.123.
Engineered calcium-peroxide product and slurry-application data (2025), Evonik Active Oxygens.
Subsurface duration does not establish sewer duration.
Nitrification basis: US EPA, Municipal Nutrient Removal Technologies Reference Document (2008).

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WASTEWATER APPLICATION ENGINEERING

Match the release profile to the treatment objective.



1 APPLICATION CONSIDERATIONS

APPLICATION	ENGINEERING ROLE	VERIFY IN THE FIELD
Collection systems & lift stations	Evaluate sulfide oxidation, oxygen supply and pH support.	Dissolved total sulfide, gas H_2S, pH, alkalinity and downstream rebound.
Biological process support	Supplement oxygen-limited zones while protecting biomass.	DO, oxygen uptake, ammonia-N and biological response.
Lagoons & sediments	Evaluate local oxygen demand and particle contact.	Sediment demand, retained solids and useful oxygen release.
Phosphorus handling	Calcium and higher pH may support phosphate precipitation.	Phosphorus speciation, pH, settling, scale and solids capture.
Soil & groundwater remediation	Support aerobic biodegradation where delivery is feasible.	Permeability, contaminant response and oxygen persistence.

2 FROM COLLECTION TO TREATMENT

A sewer-network program must account for hydraulic retention, peak loads, mixing, particle transport and solids deposition. Confirm oxygen and alkalinity delivery at downstream control points instead of assuming the injected inventory survives unchanged.

3 A STANDALONE OR CO-DOSING PROGRAM

PeroxiCal can be evaluated alone or in engineered programs with selected reagents. Nitrate and ferrous-iron studies show potential synergy. Select the program through bench testing and a controlled field trial; see page 6.

4 MEASURE THE RIGHT ENDPOINTS



- Dissolved sulfide and headspace H_2S
- DO, pH and alkalinity
- Flow, temperature and retention time
- Residual peroxide and solids
- Downstream biomass and corrosion trends.

5 WHAT PERFORMANCE DOES NOT IMPLY



Lower gas H_2S alone does not prove total sulfide removal. ORP alone is not a removal endpoint. Do not assume permanent SRB elimination, complete nutrient removal, automatic sludge reduction or full hydrogen-peroxide replacement.

Application guidance is an engineering evaluation framework, not product-specific field-test results.

Nitrate synergy: DOI 10.1016/j.scitotenv.2022.158913.
Ferrous synergy: DOI 10.1016/j.jhazmat.2025.137285.

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DOSING, FEED SYSTEMS & HANDLING

Practical design for a controlled oxidizer program.



1 START WITH AN OXYGEN MASS BALANCE

Product mass per day = required useful oxygen per day ÷ (available-oxygen fraction × useful-recovery fraction).

Illustration: 10 kg useful O_2/day ÷ (0.175 × 0.50) = 114 kg powder/day.

Assumes 17.5% powder assay and 50% useful recovery. This is not a treatment-dose recommendation; validate release kinetics and alkalinity demand separately.

2 CONVERT FLOW TO FEED

Powder-equivalent feed (kg/day) = flow (ML/day) × powder-equivalent dose (mg/L).

Convert delivered slurry using its actual solids fraction and density.

3 DESIGN FOR SOLIDS

- Keep slurry uniformly suspended.
- Select compatible pumps, seals and wetted materials.
- Provide cleanout access and backflow prevention.
- Evaluate particle retention, deposition and downstream solids handling.

4 SEPARATE CO-DOSING FROM PREMIXING

Compatibility in dilute wastewater does not establish concentrate compatibility. Use separate storage and feed points where required. Do not mix concentrates. Obtain formulation-specific compatibility guidance before combining products.

5 STORAGE & OPERATOR CONTROLS

Calcium peroxide is an oxidizer. Follow the current SDS for PPE, dust control, storage temperature and segregation from incompatible materials. Avoid sealed equipment that can accumulate oxygen pressure. Confirm formulation-specific transport classification and venting arrangements.

6 FIELD ACCEPTANCE & QUALITY

- Baseline and peak sulfide/odor loads.
- Defined dose, contact time and operating pH.
- Matched untreated or incumbent-treatment controls.
- Gas H_2S, dissolved sulfide, DO, alkalinity and solids.
- COA: assay, release profile, particle size, slurry solids/density.
- Agreed acceptance limits, redosing criteria and maintenance checks.

PACKAGING: 275-gallon slurry totes • 100-lb powder drums on shrink-wrapped pallets

Use the current product SDS and applicable facility requirements. This technical sheet does not replace the SDS.

Slurry preparation and application guidance: engineered calcium-peroxide technical literature (2025). Confirm recommendations for the delivered formulation.

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PEROXICAL vs. HYDROGEN PEROXIDE

Sustained solid-reservoir delivery or rapid liquid oxidation: select by the process need.



PARAMETER	PeroxiCal (calcium peroxide)	Liquid hydrogen peroxide
Form	Powder or slurry	Aqueous liquid
Delivery	Gradual release from hydrated solid particles	Immediately available liquid reagent
Oxygen capacity	17–18% available oxygen by powder weight	Depends on solution concentration; 35% H_2O_2 has about 16.5% theoretical O_2 equivalent*
Release persistence	Controlled by grade, pH, demand and particle retention	Controlled by reaction demand and decomposition
Alkalinity	Calcium hydroxide formation adds neutralizing capacity	No inherent alkali source
Product pH	11.4–11.7 in 1% aqueous preparation (OCPE specification)	Commercial stabilized grades generally acidic; confirm grade SDS
Process fit	Extended oxygenation and alkalinity support	Rapid oxidation and short-contact treatment
Feed design	Solids suspension, transport and scale management	Liquid-compatible equipment and concentration-specific handling

CAPACITY IS NOT RECOVERY

Compare useful oxygen delivered at the target location, not assay or product volume alone.

DURATION NEEDS CONTEXT

Subsurface studies report calcium-peroxide release beyond 350 days. This does not establish wastewater persistence or justify a year-long sewer claim.

ALKALINITY IS A SEPARATE VALUE

Measure acid-neutralizing capacity and operating pH. Sulfide oxidation can create acidity; pH elevation alone does not destroy total sulfide.

ENGINEERING SELECTION

Compare achieved sulfide control, useful oxygen, alkalinity demand, feed-system maintenance, scale/solids handling and total treatment cost. Neither chemistry is a universal replacement for the other.

* 35% H_2O_2 theoretical O_2 equivalent: 0.35 × 16.00 / 34.01 = 0.165 kg O_2 / kg solution. Not recovered DO.

References: engineered calcium-peroxide product data (2025); hydrogen-peroxide stability and decomposition technical data; current grade-specific SDS.

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6 STANDALONE VALUE & CHEMICAL SYNERGY

Published study results—not universal savings guarantees.



MOST ECONOMICAL STANDALONE CHEMICAL IN THE 2011 TRIAL

Othman et al. compared calcium peroxide, ferric chloride, magnesium hydroxide and calcium hypochlorite. **Calcium peroxide at 4.4 mg/L and 45 minutes** was the **lowest-cost standalone case, with greater than 90% dissolved H_2S reduction.** The study used 50%-purity calcium peroxide and 2008 local reagent prices; these are not PeroxiCal field-test results or a current quotation.[1]

At 30 minutes, calcium peroxide required 8.0 mg/L. Contact time changes the economics. The lowest-cost combined treatment in that study was ferric chloride plus magnesium hydroxide—about 12% cheaper than calcium peroxide alone. That 12% result was NOT a calcium-peroxide blend.[1]

CALCIUM PEROXIDE + NITRATE

85% LOWER CHEMICAL COST IN THE STUDIED STRATEGY

Laboratory sewer reactors showed synergistic sulfide control. Intermittent nitrate-plus-CaO_2 dosing cost 85% less than the study's continuous nitrate strategy. The combination supported nitrate-reducing sulfide oxidizers and suppressed sulfide production. It does not establish an 85% saving at every site.[2]

CALCIUM PEROXIDE + FERROUS IRON

31.3% COMBINATION COST: OF CaO_2 ALONE

A 2025 laboratory reactor study reported CaO_2/Fe^{2+} co-dosing costs equal to 31.3% of calcium-peroxide-only and 63.4% of ferrous-only treatment. At 0.30% (w/v), the reported RT50 for sulfide-production rate was 8.34 days. These are study-specific comparisons, not a recommended field dose.[3]

ENGINEER THE SYNERGY—VERIFY COMPATIBILITY

Selected dilute co-dosing programs may combine complementary oxidation, alkalinity, biological or precipitation mechanisms. Separate-feed compatibility, materials, pH, mixing, dose and reaction products must be evaluated. Do not mix concentrates. Prove total cost per achieved treatment endpoint through bench and field trials.

Synergy in wastewater is not permission to premix concentrated chemicals.

REFERENCES
[1] Othman et al. (2011), *Scientific Research and Essays* 6(17), 3601–3608. DOI: 10.5897/SRE10.897.
[2] Zhang et al. (2023), *Science of the Total Environment* 855, 158913. DOI: 10.1016/j.scitotenv.2022.158913.
[3] Zhang et al. (2025), *Journal of Hazardous Materials* 487, 137285. DOI: 10.1016/j.jhazmat.2025.137285.

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7 BEYOND ODOR: TREATMENT APPLICATIONS

Oxygen delivery. Targeted oxidation. Nutrient capture.



MATCH THE MECHANISM TO THE TREATMENT GOAL

Calcium peroxide supplies oxygen, peroxide and calcium as it reacts with water. Performance depends on release rate, wastewater demand, pH, dose, contact time and process design. The applications below are engineering opportunities supported by calcium-peroxide research, not guaranteed PeroxiCal field outcomes.

1 COLLECTION & BIOLOGICAL SUPPORT



Controlled oxygen release can supplement oxygen-limited zones. Confirm that useful oxygen delivery meets demand along the sewer or treatment stage. It does not guarantee aerobic conditions throughout a long force main or replace required aeration. Measure DO profiles, oxygen uptake and downstream biological response. [1]

2 ORGANIC PRE-CONDITIONING & EMERGING CONTAMINANTS



Laboratory sludge studies reported degradation of selected endocrine-disrupting compounds and increased solubilization. Radical formation depends on the matrix; engineered AOPs may require iron, UV or other activation. Do not assume universal pharmaceutical removal or an energy-free in-sewer AOP. Measure target compounds and transformation products. [2]

3 PHOSPHORUS CAPTURE



Released calcium can support phosphate precipitation when water chemistry and saturation conditions are suitable. Separate and remove the precipitated solids to achieve net phosphorus removal. Research on UV/CaO_2 used oxidation plus precipitation for hypophosphite treatment; this is a specific activated process. Confirm soluble P, total P and scale formation. [3]

4 PROCESS RESILIENCE & TREATMENT VERIFICATION



Assess supplemental oxygen against peak demand before crediting shock-load protection. Oxidation or sludge solubilization can change soluble COD without reducing total organic load. Track total and soluble COD, ammonia, nitrite, oxygen demand and biomass activity. Pathogen inactivation, ARG reduction and byproduct performance require application-specific validation.

DESIGN FOR MEASURABLE DOWNSTREAM VALUE

Pilot one defined objective at a time. Compare treatment benefit with chemical demand, solids production, energy and total operating cost.

REFERENCES

[1] Wang et al. (2016), *Chemical Engineering Journal* 303, 450-457. DOI: 10.1016/j.cej.2016.05.123.
[2] Zhang, Wang & Lii (2015), *Water Research* 71, 125-139. DOI: 10.1016/j.watres.2015.01.005.
[3] CaO_2/UV phosphorus removal and recovery from hypophosphite (2023), *ACS ES&T Water*. DOI: 10.1021/acsestwater.2c00610.

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8 SLUDGE & RESOURCE RECOVERY

Research-backed pathways for a broader treatment strategy.



SELECT THE PROCESS OBJECTIVE FIRST

Calcium-peroxide research spans sludge disintegration, fermentation, digestion, conditioning and composting. These are distinct treatment routes. Dose, sludge properties and sequencing determine whether oxidation helps the selected process. Published calcium-peroxide studies are not PeroxiCal field-performance guarantees.!

1 DISINTEGRATION & HYDROLYSIS



CaO_2 can disrupt extracellular polymeric substances (EPS) and release soluble organics, improving access to biodegradable substrates. Solubilization is not the same as destruction of total solids. Verify volatile-solids and COD mass balances, including added mineral solids. [1,2]

2 FERMENTATION OR METHANE RECOVERY



A 2015 laboratory study increased short-chain fatty acid production while inhibiting methane formation. A separate 2019 study used pretreatment to enhance subsequent methane yield; higher doses eventually reduced that benefit. Select SCFA, hydrogen or methane as the target, then validate the relevant pathway. Do not promise simultaneous maximization of all products. [1,2]

3 DEWATERING & CONDITIONING



A 2016 study improved filtration at an optimum CaO_2 dose, while higher doses worsened performance as excess EPS was released. Chemical re-flocculation further improved dewatering. Test cake solids, CST/SRF, solids capture, polymer/coagulant demand and wet cake tonnage. Polymer and hauling savings must be demonstrated locally. [3]

4 COMPOSTING, HUMIFICATION & RISK REDUCTION



Sludge-composting studies reported enhanced organic matter degradation and humic-substance formation, and reduced mobility of selected metals and abundance of antibiotic resistance genes (ARGs). These results apply to the studied composting conditions. Verify maturity, respiration, metal leachability and applicable pathogen criteria; no blanket disinfection or shorter-cycle guarantee. [4,5]

BUILD THE BUSINESS CASE WITH A CONTROLLED TRIAL

Compare untreated and treated sludge at the same loading and operating conditions.

Track: kg volatile solids destroyed • gas yield and composition • SCFA yield • cake dry solids • residual oxidant • total chemical, energy and disposal cost.

Account for calcium-containing residuals and return-liquor impacts.

REFERENCES

[1] Li et al. (2015), *Water Research* 83, 84-93. DOI: 10.1016/j.watres.2015.06.021.
[2] Wang et al. (2019), *Water Research* 164, 114934. DOI: 10.1016/j.watres.2019.114934.
[3] Chen et al. (2016), *Water Research* 103, 170-181. DOI: 10.1016/j.watres.2016.07.018.
[4] Bao et al. (2022), *Journal of Hazardous Materials* 439, 129592. DOI: 10.1016/j.jhazmat.2022.129592.
[5] Bao et al. (2023), *Bioresource Technology* 384, 129267. DOI: 10.1016/j.biortech.2023.129267.

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