



NanoDose™ Iron Removal Dosing Kit

Chemical oxidant make-up and dosing skid for iron & manganese oxidation and disinfection of raw borehole water — model NDK-100-Fe, delivered via the NanoJet™ FUSION™ turbulent reactor.

100 L Oxidant make-up & dosing tank capacity	3 Oxidant options — NaOCl, H ₂ O ₂ or KMnO ₄	≤10 L/h Etatron PKX dosing range @ up to 6 bar	AUTO Continuous metered dosing, no recirculation
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01 Overview

The NanoDose™ Iron Removal Dosing Kit is a self-contained chemical make-up and dosing skid built to prepare, hold and continuously proportion a chemical oxidant into raw borehole water ahead of the contact tank — driving iron and manganese oxidation, and providing a sanitising effect against bacteria and other micro-organisms.

- Combines a 100 L chemical make-up/day tank with an Etatron PKX solenoid-diaphragm metering pump, delivering the dosed oxidant into the raw water ahead of, or directly at, the NanoJet™ FUSION™ Borehole Pressure-Boost Kit.
- Three oxidant chemistries are supported — sodium hypochlorite, hydrogen peroxide, or potassium permanganate — selected to suit the raw water's iron/manganese load, organic content and disinfection requirement (Section 4).
- Unlike the alum-based NanoDose™ Flocculant Dosing Kit, this unit doses a true chemical solution rather than a slurry that must be kept in suspension, so it runs without a recirculation pump or in-tank mixing nozzle (Section 2).

02 System Configuration

100 L Make-Up / Day Tank	Chemical-resistant tank that holds the made-up oxidant solution, sized for a full duty/standby dosing cycle between refills. No recirculation is required — sodium hypochlorite, hydrogen peroxide and potassium permanganate solutions, at the concentrations used for dosing, do not settle out or need continuous mixing to stay in solution.
Etatron PKX Dosing Pump	Solenoid-diaphragm metering pump that draws oxidant solution from the tank and injects it at a precisely controlled, adjustable rate — at the dosing point set out in Section 7 for the chemical selected.

NanoJet™ FUSION™ Borehole Pressure-Boost Kit

The preferred delivery and reaction system: stabilises borehole pressure, entrains atmospheric oxygen through its Venturi, and drives cavitation and turbulent mixing that completes oxidation ahead of the contact tank (Sections 3 & 7).

No peripheral recirculation pump

The 0.37 kW peripheral pump and NanoJet EcoShear™ in-tank nozzle fitted to the alum-based NanoDose™ Flocculant Dosing Kit are not required here. All three oxidants are dosed as clear solutions, so a static make-up tank and a single metering pump are sufficient.

03 How the System Works

• MAKE-UP TANK

Oxidant solution prepared & stored in the 100 L tank



• METERED DOSING

Etatron PKX injects a precise dose at the point set for the chemical used



• NANOJET™ FUSION™ REACTOR

Turbulence & cavitation complete mixing and oxidation ahead of the contact tank

- The chosen oxidant is made up in the day tank at the concentration required for the site's dosing rate.
- The Etatron PKX pump draws from the tank and injects a metered, adjustable dose — either into the raw water line ahead of the NanoJet™ FUSION™ Venturi, or directly at the Venturi injection port, depending on which oxidant is in use (Section 7).
- The NanoJet™ FUSION™ reactor boosts pressure, entrains atmospheric oxygen and generates cavitation and turbulent mixing, driving the oxidation of dissolved iron and manganese to completion before the water reaches the contact/settling tank.

Commissioning note

Oxidant demand is raw-water specific — iron, manganese, organic matter and pH all affect the dose required. Cape WaterTech recommends a raw water analysis and jar testing to confirm the dose rate and oxidant choice before final commissioning.

04 Oxidant Options at a Glance

Three oxidant chemistries are available for the NanoDose™ Iron Removal Dosing Kit. All three oxidise dissolved ferrous iron (Fe^{2+}) and manganese (Mn^{2+}) to insoluble forms that can be flocculated and filtered; each has a different chemistry, dose demand and disinfection profile — see Sections 5 & 6.

OXIDANT	BEST SUITED TO	TYPICAL DOSE RATIO†	DISINFECTION EFFECT
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Sodium Hypochlorite (NaOCl)	Iron removal, and sites needing a disinfection residual. Manganese removal is slow unless pH is raised toward 9–9.5.	$\approx 0.64 \text{ mg Cl}_2 / \text{mg Fe}^{2+}$ $\approx 1.3 \text{ mg Cl}_2 / \text{mg Mn}^{2+}$ (high pH)	Strong — primary disinfectant, leaves a measurable residual
Hydrogen Peroxide (H₂O₂)	Iron and manganese removal without chlorinated by-products; sites wanting no chemical taste/odour or persistent residual.	$\approx 0.3 \text{ mg H}_2\text{O}_2 / \text{mg Fe}^{2+}$ (theoretical min.) $\approx 0.6 \text{ mg H}_2\text{O}_2 / \text{mg Mn}^{2+}$ (theoretical min.)	Moderate — broad-spectrum sanitising effect, no lasting residual
Potassium Permanganate (KMnO₄)	Manganese removal in particular — fast, reliable oxidation across a wide pH range without needing chlorine's high-pH conditions.	$\approx 0.94 \text{ mg KMnO}_4 / \text{mg Fe}^{2+}$ $\approx 1.92 \text{ mg KMnO}_4 / \text{mg Mn}^{2+}$	Mild — some oxidative/algistatic effect; not a substitute for primary disinfection

[†] Theoretical stoichiometric minimum. Practical dose is normally higher once organic demand, pH and contact time are accounted for — confirm by jar testing (Section 3).

05 The Chemistry of Iron & Manganese Oxidation

SODIUM HYPOCHLORITE

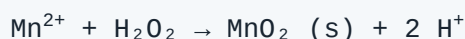
Hypochlorite oxidises ferrous iron quickly and reliably at normal raw-water pH:



Manganese oxidation by chlorine follows the same pathway but is markedly slower, and only proceeds at a practical rate once pH is raised to roughly 9–9.5 — well above the kit's normal 7.0–8.5 operating band (Section 7). Where manganese is present in meaningful concentration, hydrogen peroxide or potassium permanganate is generally the better-suited oxidant.

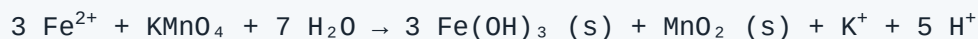
HYDROGEN PEROXIDE

Hydrogen peroxide oxidises both ferrous iron and manganese directly, without needing dissolved oxygen or a chlorine residual, and breaks down to water and oxygen rather than a halogenated by-product:



Because peroxide is a strong oxidant in its own right, it does not need — and is not helped by — atmospheric air entrainment ahead of the reaction. It is also readily decomposed back to water and oxygen by turbulence, cavitation and contact with catalytic surfaces (including trace iron and manganese oxides — the very contaminants it targets). See Section 7 for why this changes where it should be dosed.

Permanganate is the classic oxidant for manganese, reacting readily across a wide pH range and leaving behind a manganese dioxide (MnO_2) floc that itself helps adsorb and catalyse further Mn^{2+} removal:



Overdosing risk

Excess permanganate carries through as a pink/purple residual ("pink water"). Dose conservatively against a confirmed Fe/Mn analysis, and consider a polishing filter stage (e.g. manganese greensand) downstream rather than chasing complete oxidation on dose alone.

06 Sanitising & Disinfection Effect

All three oxidants attack the same cell structures and organic matter that make them effective against iron and manganese, which gives each of them some ability to kill or deactivate bacteria and other micro-organisms in the raw water — but the strength and duration of that effect differs, and the kit should not be specified on disinfection performance alone without confirming it against the site's actual pathogen risk.

NaOCL

- The industry-standard water disinfectant — fast-acting against most bacteria and viruses.
- Leaves a measurable chlorine residual, giving ongoing protection into the contact tank and downstream.
- Can form chlorinated by-products (e.g. trihalomethanes) where raw water carries significant natural organic matter — worth checking on higher-colour boreholes.

H₂O₂

- A genuine broad-spectrum sanitiser — used widely for bacterial and biofilm control in food, healthcare and aquaculture settings.
- Leaves no chemical taste, odour or halogenated by-product; breaks down to water and oxygen.
- No persistent residual once it has reacted — effective at the point of dosing, but offers no ongoing protection further downstream.

KMNO₄

- A mild oxidative/algalstatic effect on some micro-organisms and algae, and has seen historical use as an emergency disinfectant.
- Not a reliable primary disinfectant by modern standards — no meaningful residual and inconsistent pathogen kill compared with chlorine or peroxide.
- Best specified for its Fe/Mn oxidation strength; pair with NaOCl or H₂O₂ if disinfection is also required.

Choosing on disinfection need

Where a measurable, ongoing disinfection residual matters (e.g. potable supply with distribution storage), sodium hypochlorite is normally the better-suited choice. Where the priority is oxidation without chemical taste/odour or halogenated by-products, hydrogen peroxide is often preferred, with its sanitising effect understood as a useful secondary benefit rather than the primary duty.

07 Dosing Point & the NanoJet™ FUSION™ Delivery System

The NanoJet™ FUSION™ Borehole Pressure-Boost Kit is the preferred delivery mechanism for all three oxidants: it stabilises incoming borehole pressure, drives the water through a high-velocity reactor nozzle, and entrains atmospheric oxygen while generating cavitation and turbulent mixing — the same oxygenation, turbulence and cavitation benefits described in the NanoJet™ Borehole Pressure-Boost Kits data sheet. Where the dosed chemical is injected into that system, however, is not the same for all three oxidants.

OXIDANT	INJECTION POINT	WHY
● NaOCl	Raw water line, upstream of the NanoJet™ FUSION™ Venturi	Chlorine is stable through the reactor; the turbulence, cavitation and entrained air aid mixing and add supplementary dissolved oxygen for iron oxidation.
● KMnO₄	Raw water line, upstream of the NanoJet™ FUSION™ Venturi	Permanganate is likewise stable through the reactor and benefits from the extra mixing time and turbulence on the way to the contact tank.
● H₂O₂	Directly at the NanoJet™ FUSION™ Venturi injection port (not pre-dosed upstream)	Peroxide does not need atmospheric air to oxidise Fe/Mn, and pre-exposing it to the reactor's turbulence, cavitation and entrained air ahead of the raw water promotes premature decomposition back to water and oxygen — wasting active oxidant before it ever reaches the contaminants it is meant to treat.

Hydrogen peroxide dosing point

Route the H₂O₂ dosing line to the Venturi's injection/suction port itself — the same port that would otherwise draw in atmospheric air — rather than into the raw water line ahead of the reactor. This puts the peroxide into contact with the raw water at the point of maximum turbulence, within its usable reaction window, instead of losing strength to catalytic and mechanical decomposition on the way there. Sodium hypochlorite and potassium permanganate do not carry this restriction and should be dosed upstream as set out above.

Across all three oxidants, Cape WaterTech recommends correcting raw water pH to 7.0–8.5 ahead of or during oxidation — the same target band used for the alum-based NanoDose™ Flocculant Dosing Kit downstream. This range gives reliable Fe²⁺/Mn²⁺ oxidation kinetics for hydrogen peroxide and potassium permanganate, and keeps the water within the effective coagulation band once alum is dosed further downstream; sodium hypochlorite's manganese performance specifically benefits from pH nearer the top of, or above, this band (see Section 5).

Materials of construction

All three oxidants are aggressive chemicals. Specify PVDF/PTFE/PP wetted parts throughout the tank and dosing pump, and avoid brass or copper fittings on the hydrogen peroxide line in particular — these are strong catalysts for peroxide decomposition. Vent the make-up tank on hydrogen peroxide duty, as decomposition releases oxygen gas.

08 Technical Specifications

100 L MAKE-UP / DAY TANK

Capacity	100 L nominal working volume
Construction	Chemical-resistant polyethylene (PE) or PVDF-lined tank, UV-stabilised, with lockable lid and inspection port; vented lid recommended on hydrogen peroxide duty
Chemical held	Sodium hypochlorite, hydrogen peroxide, or potassium permanganate solution — one oxidant per kit, sized to the selected chemistry
Level indication	Sight tube standard; float-switch low-level alarm/interlock optional
Mounting	Free-standing on skid/bund; wall-mounted bracket kit optional

ETATRON PKX DOSING PUMP

Type	Solenoid-driven diaphragm metering pump
Flow rate range	Model-dependent, up to approx. 10 L/h at rated pressure; sized to the site's calculated oxidant dose
Max. discharge pressure	Up to approx. 6 bar (model-dependent)
Control	Manual (0–100%) or proportional dosing — pulse/volumetric timer, 4–20 mA or ORP-linked control available (ORP control recommended for hypochlorite duty)
Wetted parts	Pump head: PVDF recommended for all three oxidants; diaphragm: PTFE; valves: PTFE/EPDM — avoid FPM (Viton) and any brass/copper fitting on hydrogen peroxide duty
Power supply	230 V / 50 Hz standard (12 Vdc, 24 Vdc/Vac variants available)
Enclosure	Anti-acid plastic casing, IP65
Connections	4×6 mm dosing tube, standard suction/injection valve kit

NANOJET™ FUSION™ BOREHOLE PRESSURE-BOOST KIT

Function	Pressure stabilisation, atmospheric air entrainment via Venturi, and cavitation/turbulent mixing — the oxidant delivery and reaction stage for this kit
Flow velocity boost	Up to 25× at the reactor nozzle aperture
Activation	Automatic on the borehole pump/float-switch fill cycle
Oxidant injection ports	Raw water line (upstream, for NaOCl/KMnO ₄) and Venturi injection port (for H ₂ O ₂) — see Section 7

See the separate NanoJet™ Borehole Pressure-Boost Kits data sheet for full specification of the reactor unit.

UTILITIES & SITE REQUIREMENTS

Electrical	Single-phase 230 V / 50 Hz supply for the dosing pump and NanoJet™ FUSION™ boost pump
Chemical supply	Sodium hypochlorite, hydrogen peroxide, or potassium permanganate — water-treatment grade
Containment	Bunded area or drip tray recommended beneath the tank and pump; segregate from incompatible chemicals (see Section 5/7 handling notes)
Raw water tie-in	Dosing/injection point on the raw water pipeline ahead of the NanoJet™ FUSION™ kit, per Section 7

09 Standard Kit Contents & Options

STANDARD KIT INCLUDES

100 L make-up/day tank with lid (PVDF-lined option for peroxide duty)

Etatron PKX dosing pump with suction & injection valve kit

Interconnecting tubing, fittings & mounting hardware

Dosing point fitting kit matched to the oxidant selected (Section 7)

OPTIONAL EXTRAS

NanoJet™ FUSION™ Borehole Pressure-Boost Kit (recommended delivery system)

pH correction dosing skid (soda ash / caustic soda)

ORP-linked dosing control (recommended on hypochlorite duty)

Low-level float switch, alarm & pump interlock

Bunded tank base / drip tray

Downstream polishing filter (e.g. manganese greensand) for permanganate duty

Oxidant choice and dosing rate are raw-water specific. Contact Cape WaterTech (Pty) Ltd with a raw water analysis (iron, manganese, pH, organics) for a site-specific recommendation and quotation.