



English

Imperial Units



# KEMSOLID®

build on solid foundations

Rock cutting technology  
for civil engineering —  
fast, efficient and environ-  
mentally friendly.



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The KSI process is a technology used to produce soil-cement structures. KSI soil mixing attachments can be installed on excavators or drilling and pilling equipment to achieve production of soil-cement diaphragm and retaining walls.

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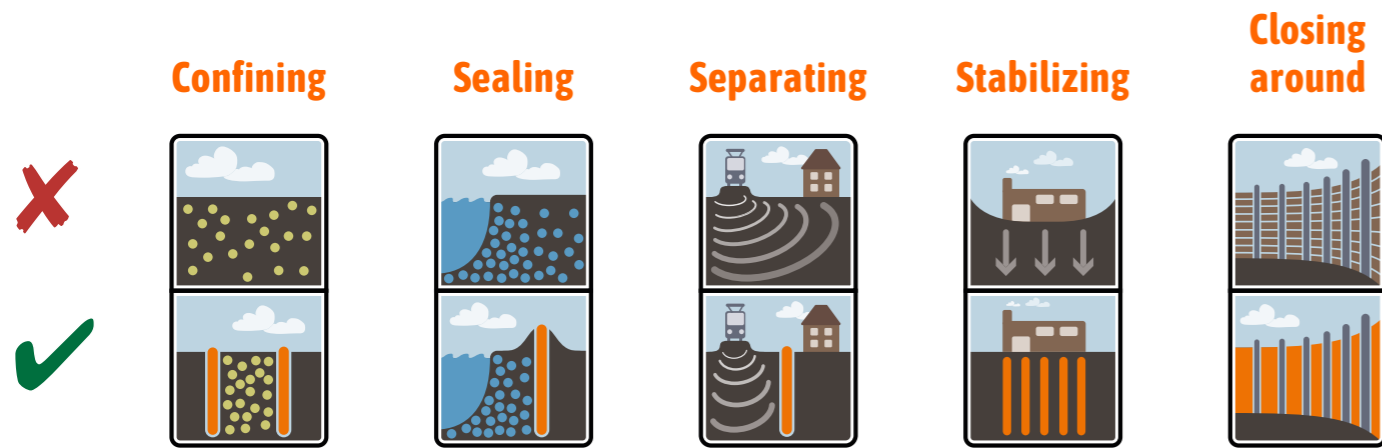
The KRX range of Powertool drive units designed to work with milling, drilling and mixing attachments can be used to produce in-situ concrete piles using a flushing head, hollow auger and drill bit.

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There are many ways rock grinding technology from KEMROC can be used in earthworks and civil engineering.

KEMSOLID is the name of KEMROC's new division dedicated to soil stabilization and ground improvement. This newly established business is focused on the development, testing and manufacturing of soil mixing attachments. Planning and design firms, construction companies, appraisers and clients also receive a full package of expertise and advice from foundation engineering specialist.

## The Kemsolid KSI process



The KSI process is a technology used to produce soil-cement structures. KSI soil mixing attachments can be installed on excavators or drilling and piling equipment to achieve production of soil-cement diaphragm and retaining walls. Once the blade has achieved the required depth using the moving cutter chain binder solution is piped through to the lowest point of the blade and injected into the soil. A mixing process follows until a uniform suspension with the required consistency of soil and cement has been reached. This creates an impermeable, stable soil-cement structure

to the required dimensions. Type and concentration of binder solutions will vary according to load bearing and permeability levels required.

The technology evolved from rock cutting attachments, which makes operating in difficult, stony conditions possible. At the same time, it is also feasible to integrate the soil-cement structure into solid ground or rock.

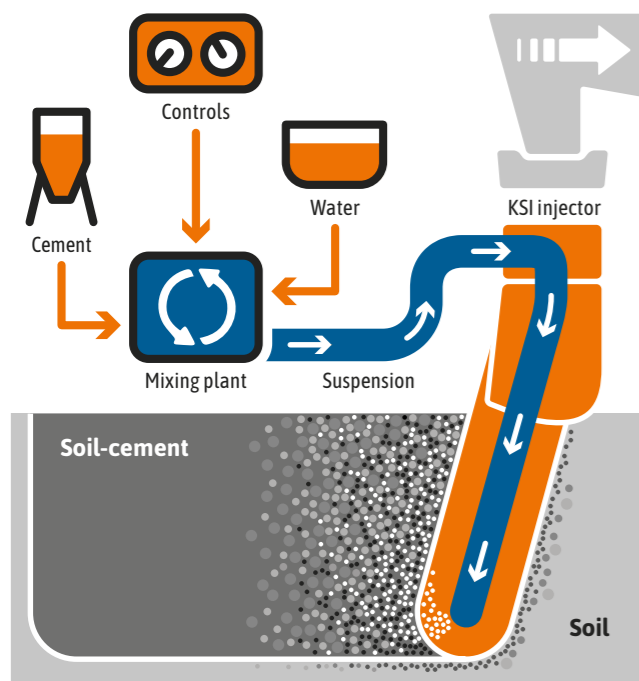
Production rates depend on soil types and ground conditions. Daily rates of 320 linear feet with depth of 32 feet and width of 17 inches are possible to achieve.

### Advantages of the KSI process

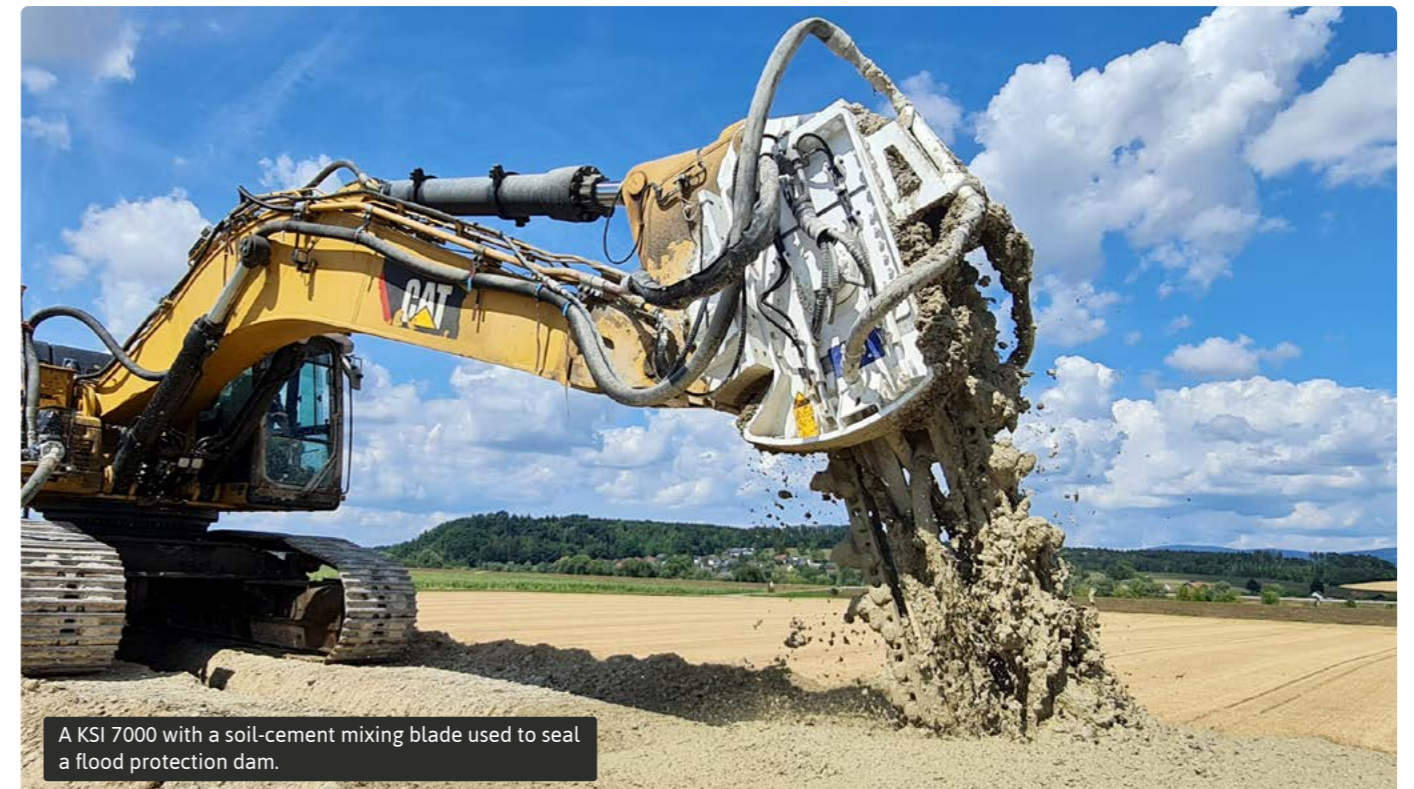
In contrast to the use of conventional diaphragm wall equipment, which carries out segment by segment walls, the KSI process and its attachments achieve a continuous structure over the entire length of the wall. Misalignment of any individual segments is therefore eliminated. The blade of the KSI attachment mixes the soil in-situ continuously over the entire installation depth. This ensures that the soil-cement structure is uniformly homogeneous in all aspects after curing. As the chain is fitted with dragon teeth cutters, the soil-cement structure can be easily integrated into existing rock deposits to ensure proper sealing at the connecting points.

The KSI process is extremely versatile for addressing soil permeability and load bearing issues. It can, for example, be used to seal excavations or enclose polluted areas. It can also be used to seal dams, dykes and other bodies of water as well as creating a barrier to prevent waves traveling from sources of vibration. In trenching and construction of large warehouses, it can be used to fill the gaps between supports. It can also be used in applications where new roads are being built on soils with low load bearing capacity or the load bearing capacity must be increased to cope with extra weight or higher traffic speeds. These include some high-speed railway and motorway routes.

### KSI process schematic



A completed soil-cement structure exposed for inspection and testing.



A KSI 7000 with a soil-cement mixing blade used to seal a flood protection dam.

## The KSI range of injection attachments

KSI soil mixing attachments are available in two sizes for mounting on excavators between 77,000 and 264,000 lb operating weight and can be supplied with a range of blade lengths. The KSI 7000 model can be equipped with blades suitable for mixing depths of 16, 19 or 22 ft, while the larger

KSI 12000 model can take blades for mixing depths of 19, 26, 32 or 39 ft. Depending on the application, the blades can be produced with cutter plates for different mixing widths. Both models can be supplied with a rotation module as an optional extra.

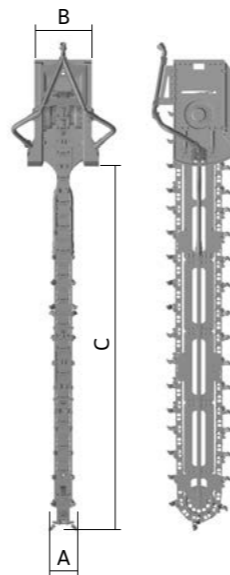
### KSI 7000      KSI 12000

Recommended excavator weight	lb	77,000–120,000	110,000–176,000 <sup>[1]</sup>   176,000–264,000
Rated hydraulic power	hp (kW)	175 (130)	295 (220)
Mixing width (A)	in	13–19	17–23
Width of gearbox (B)	in	39	53
Modular mixing depth (C)	ft	16   19   22	19   26   32   39
Recommended chain speed	ft/s	6–8	6–8
Recommended oil flow at 2,200 psi (150 bar)	gal/min	79–105	145–185
Max. oil flow	gal/min	105	185
Max. operating hydraulic pressure	psi (bar)	5,800 (400)	5,800 (400)
Max. permissible ground compressive strength	psi (MPa)	1,450 (10)	1,450 (10)
Standard mixing tool	Type	DT 22/46/38/22 HC	DT 22/90/70/30 HQ

#### Weight

Weight of attachment built for max. mixing depth	lb	9,900	27,500
Weight per section for extension (¾ ft)	lb	770	1,500

<sup>[1]</sup> Attachment only with special adapter to boom and additional counterweight on excavator. Size of counterweight depends on excavator and should be agreed with excavator manufacturer.



### Attachment and adapter options



Excavator adapter plate with standard hole pattern for use with adapter plates or quick couplers (e.g. Lehnhoff, OilQuick, etc)

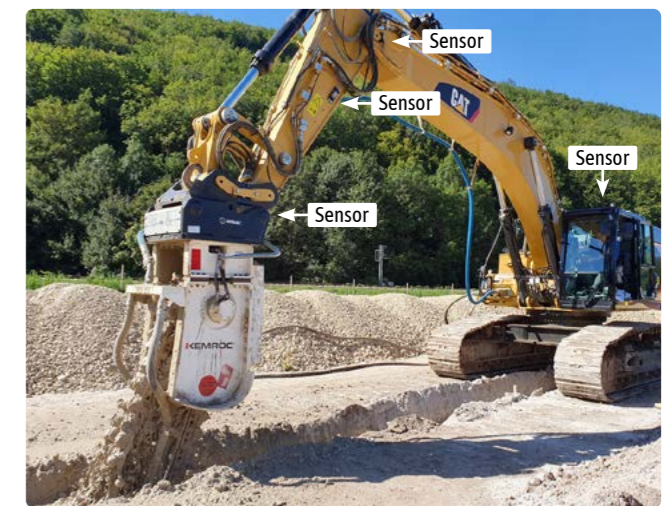
Adaptation for 110,000-lb and bigger excavators with short boom and no dipper stick

Adaptation for a leader on a drill or pile driving rig

Digital and individual recording of process parameters on the KSI mixing attachment and excavator to document performance, quantity and quality.

### Maintenance free and reliable measurement of the mixing depth

Robust, vibration resistant sensors continuously record position of boom segments and the attachment. The data is presented as a kinematic model providing real-time information for mixing depth and delivery accurate to the nearest centimeter.



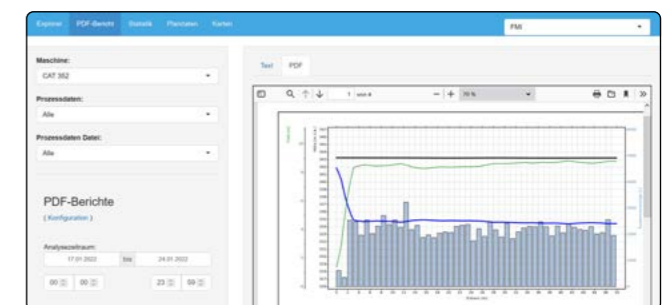
### High-precision positioning of the mixing attachment using 2-antenna RTK GNSS/GPS sensors located on the excavator

Satellite-based navigation and data acquisition processing are integrated in a compact system enabling optimal operator assistance for the KSI process. All essential information is immediately available on a single monitor in the operator's cab.



### Data management with immediate availability of process data

PDF reporting and interactive data analysis in a web based application tailored to foundation engineering. We recommend collecting the following data: position of top and bottom of the slot, amount of suspension used and location (GPS).



## The Kemsolid MSM process

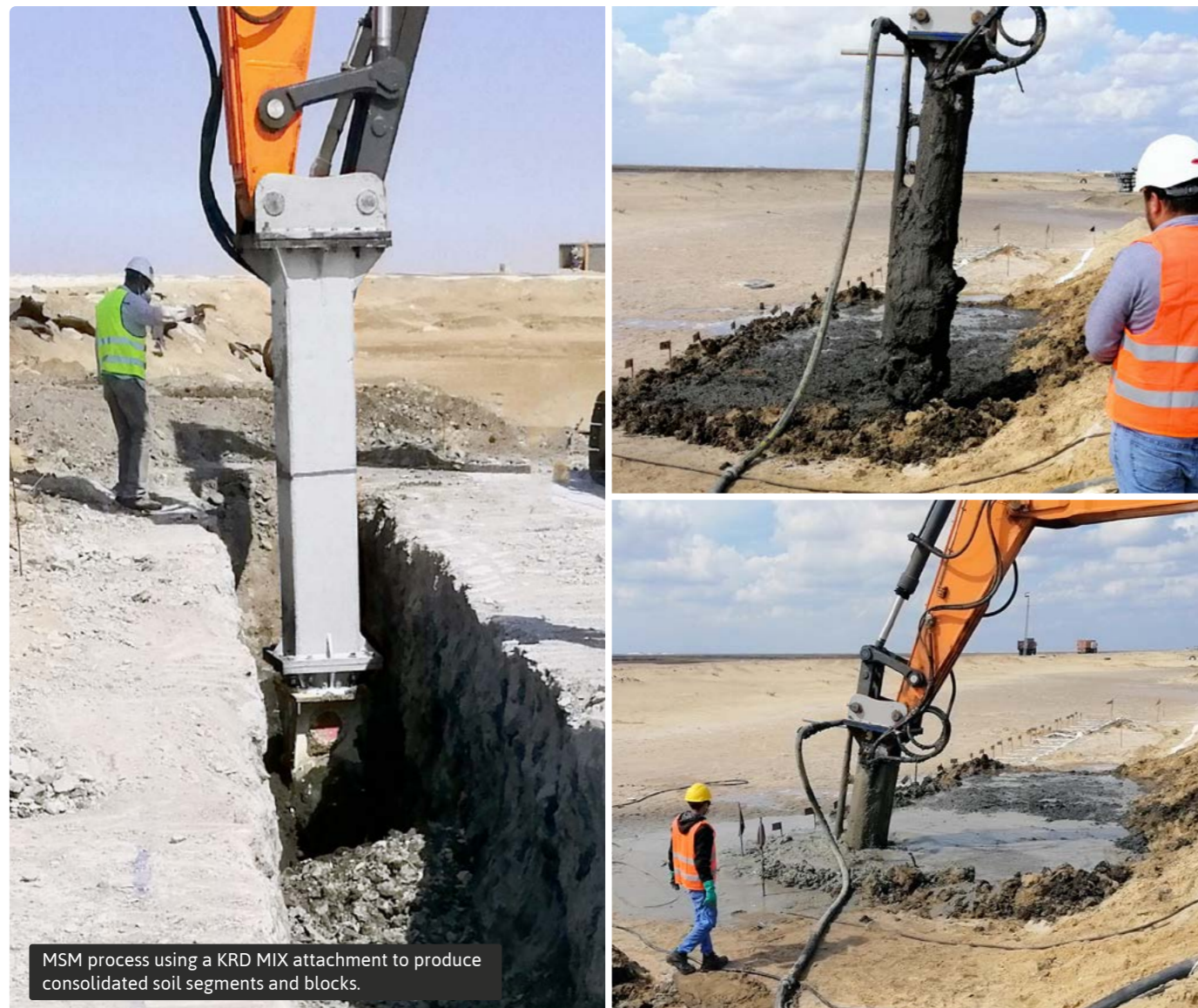
The Kemsolid MSM process is a subsoil improvement and soil stabilization technique using the KRD MIX range of mixing cutters on a standard excavator.

The MSM process is used for very soft to fluid soils, with MSM standing for "Mass Soil Mixing". By using a KRD MIX attachment to mechanically mix the in-situ soil with either a dry binder or a suspension of mortar or cement, the soil can be consolidated or strengthened as required. Compressed air or pumps are used to supply the additive via a line on the attachment to the middle of the KRD MIX in the soil.

Due to the operating characteristic of the attachment, mixing can continue through solid layers as well as in sandy

or silty soils. Using surface material in the additive for mixing into subsurface soils is also possible.

The extension can be assembled depending on job requirement.

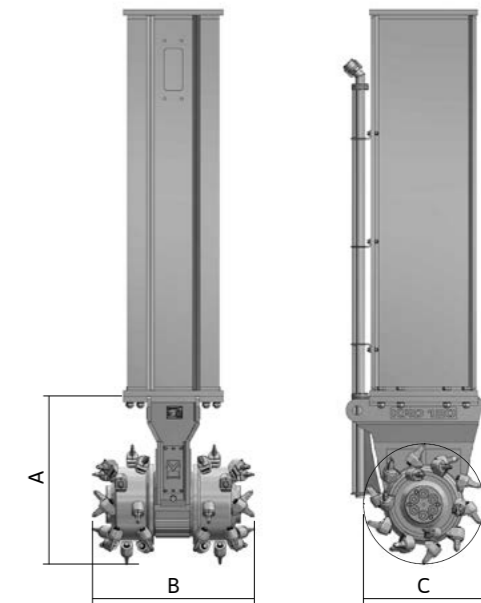


MSM process using a KRD MIX attachment to produce consolidated soil segments and blocks.

The MSM process is a technology used for subsoil improvement and soil stabilization in very soft to fluid soil conditions.

### The KRD MIX range of mixing attachments

Mixing attachment in the KRD MIX range are available in three sizes for 55,000 to 110,000 lb excavators. Maximum mixing depth of 19 feet can be achieved with these attachments.



		<b>KRD 120 MIX</b>	<b>KRD 150 MIX</b>	<b>KRD 165 MIX</b>
Recommended excavator weight	lb	55,000–88,000	66,000–88,000	77,000–110,000
Rated power	hp (kW)	160 (120)	160 (120)	214 (160)
Length of mixing cutter without extension (A)	in	42	42	42
Width of mixing head (B)	in	39	39	49
Diameter of mixing head (C)	in	28	28	28
Recommended rotation speed	rpm	70	65	60
Recommended oil flow	gal/min	66–87	74–92	79–103
Max. oil flow at 150 psi (10 bar)	gal/min	92	92	106
Max. operating hydraulic pressure	psi (bar)	5,800 (400)	5,800 (400)	5,800 (400)
Weight	lb	3,300	3,300	4,450
Pick box	Type	PH 32 HD	PH 32 HD	PH 32 HD
Number of picks	Pcs	48	48	58
Standard pick <sup>[1]</sup>	Type	DT 22/90/70/30 HQ	DT 22/90/70/30 HQ	DT 22/90/70/30 HQ
<b>Extension</b>				
Max. mixing depth	ft	19	19	19
Possible extensions	ft	6.5–16.4	6.5–16.4	6.5–16.4

<sup>[1]</sup> Depending on application, mixing heads can be supplied with a choice of pick according to the type of pick box used.

## The KRX range and the Kemsolid CFA process

The KRX range of Powertool drive units with attachments for milling, drilling and mixing (selection of relevant models)

The KRX range of Powertool drive units are extremely robust and use a radial piston motor to generate extremely high torque and cutting forces. With a selection of very heavy duty tools, they are an ideal attachment for your excavator for a wide variety of civil engineering applications.

### Drive

### Milling attachment

### Drilling attachment



Cutter head with round attack or dragon tooth picks



Cutter head with spiral extension



Drilling auger with pilot bit

**KRX 70**   **KRX 110**   **KRX 120**   **KRX 130**   **KRX 140**

	lb	33K-55K	44K-77K	55K-88K	55K-88K	66K-110K
Recommended excavator weight	lb	33K-55K	44K-77K	55K-88K	55K-88K	66K-110K
Rated power	hp (kW)	94 (70)	148 (110)	160 (120)	160 (120)	188 (140)
Length of drive unit	in	32	33	33	33	34
Torque at 5,500 psi (380 bar)	lbf-ft	11,800	18,740	22,350	24,340	26,850
Max. oil flow at 150 psi (10 bar)	gal/min	79	85	92	92	103
Max. hydraulic pressure	psi (bar)	5,800 (400)	5,800 (400)	5,800 (400)	5,800 (400)	5,800 (400)
Weight without attachment	lb	1,150	1,200	1,200	1,200	2,000
Hex connection, standard	in	6	6	6	6	6



KRX 120 drilling holes for anchors in concrete retaining walls.

Another application for the KRX range is the production of in-situ concrete piles using a flushing head, hollow stem auger and an auger drill bit.

### The Kemsolid CFA process

The CFA process is used to produce in-situ concrete piles up to 10 feet and CFA piles from 10 to 20 feet. Using conventional excavators, together with the KRX attachment range, makes the process very flexible and cost-effective. Productivity is higher when compared to using cased drilling methods.

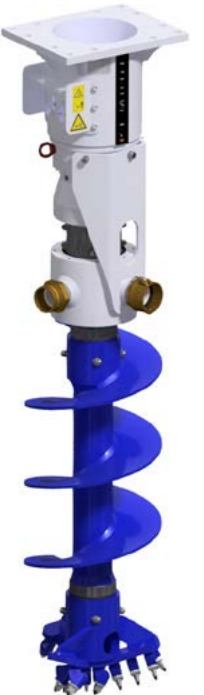
To create piles, hydraulic power from the excavator is used to continuously rotate an auger attached to the excavator that is the full length of the pile. The auger is driven into the soil to the desired depth (piling depth) and then raised while at the same time concrete is pumped via the flushing head and hollow auger to the drill bit to fill the hole. During the entire process, the auger keeps the borehole stabilized.

As required, reinforcement cages, steel girders or casing can be subsequently installed into the fresh concrete.

The low vibration process can be used in almost all soil types regardless of the groundwater level.



Flushing head adapted for pumping concrete



KRX 70 with concrete pumping swivel



KRX 120 processing bored pile heads.



KRX 110 cutting bored piles.

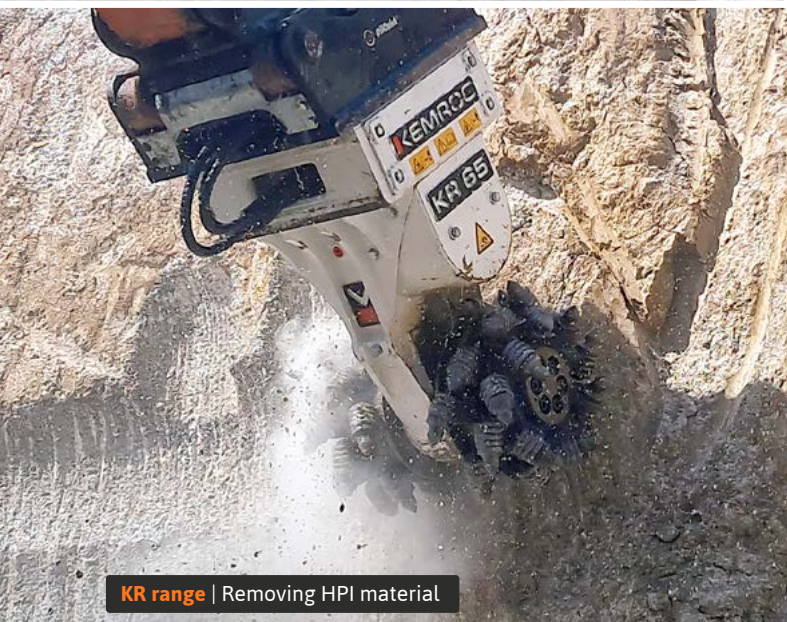
## Other applications in earthworks and civil engineering



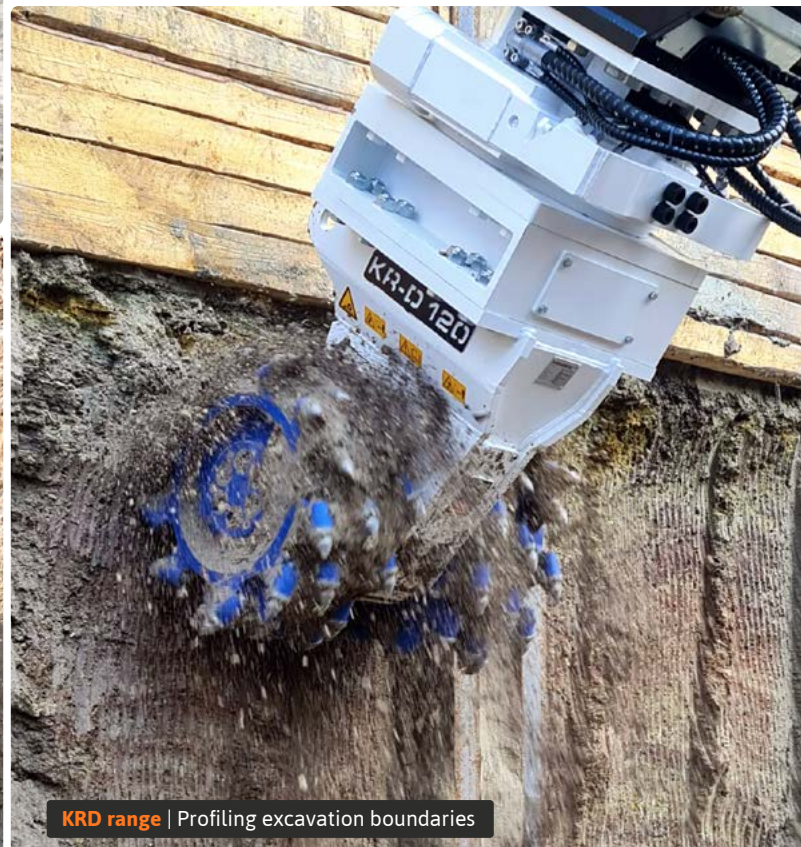
ES range | Profiling diaphragm walls



KRX range | Capping bored piles



KR range | Removing HPI material



KRD range | Profiling excavation boundaries



[www.kemsolid.com](http://www.kemsolid.com)

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