



PRODUCT CATALOG

GROUNDING SYSTEMS

LIGHTNING PROTECTION

ELECTRICAL PROTECTION

ELECTRICAL NOISE MITIGATION SYSTEMS

CATHODIC PROTECTION SYSTEMS FOR PIPELINES, REFINERIES AND TANK FARMS

AC MITIGATION SYSTEMS FOR PIPELINES

INTRODUCTION

The SAE product portfolio was originally developed in response to its burgeoning systems engineering business and its continual search for better, more effective solutions. Unable to find what it needed from suppliers of traditional technologies for grounding and cathodic protection applications, SAE undertook to develop its own products.

Taking its cue from the extensive real-world experience garnered from its systems engineering business, SAE has developed and brought to market a suite of advanced technology products built to improve the performance of existing technological solutions. More importantly, these products have been built specifically to address the emerging challenges of the 21st Century, especially the increased attention to environmental factors.

Forward looking, with real-world conditions and financial constraints in mind, and with better performance than traditional solutions, SAE products are designed to improve the operation and longevity of client networks and infrastructure, even as they improve bottom-line financial results through a reduction in operational, maintenance and unplanned service outage costs.

CONCRETE®

At the core of its solutions in every application area, from petroleum to telecommunications, is the flexible and versatile Conducrete® family of products.

AEL ANODES®

Developed for the petrochemical and pipeline transport industries, and in response to increasingly stringent environmental regulations governing impressed current cathodic protection systems, SAE has developed the advanced extended life AEL Anode, a family of new technology anodes that far exceeds existing operational performance and longevity parameters.

ENVIRANODE® CP SYSTEMS

SAE has incorporated their advanced AEL anodes into a complete cathodic protection system, the EnvirAnode®. This system represents a major advance in cathodic protection thinking, in that it not only provides superlative electrical performance and an extended operating life, but does so in a low impact, environmentally neutral package, effectively rewriting the book on deep bed anode cathodic protection systems.

ENVIRANODE® CP KITS

An innovative solution to cathodic protection applications that utilizes the new SAE EnvirAnode® CPS technology in complete, off-the-shelf kits in 25A and 50A variations. These kits effectively satisfy greater than 60% of the cathodic protection market requirements, and offer all of the inherent operational and environmental benefits of the EnvirAnode® technology.

PRODUCT OVERVIEW

Conducrete® is a robust, cementitious and carbonaceous material designed for the demanding electrical and ecological environments of modern electrical and lightning protection, cathodic protection and AC mitigation systems. Available in a number of variants formulated for specific applications, Conducrete® enhances the performance, reliability and longevity of traditional grounding, CP and other protection systems whenever it is used, while reducing the overall operational and maintenance costs of the infrastructure and systems it protects.

CONDUCRETE® PRODUCT FAMILY

PRODUCT FAMILY		KEY APPLICATIONS	PREDOMINANT BAG OR BAG TEXT COLOR	DESCRIPTION
DM	100	<ul style="list-style-type: none"> Electrical and lightning protection grounding systems Electrical noise mitigation systems 	Dark Blue	A cementitious, carbonaceous conductive product designed for use in normal, non-corrosive soil conditions. Conducrete® DM mixes are hygroscopic and designed to bond with copper cables, CP anodes and the surrounding soil to provide high performance energy dissipation over larger surface areas. Conducrete® DM provides protection against electrolytic corrosion in copper and anodic elements, resulting in very long system lifetimes.
	300	<ul style="list-style-type: none"> AC mitigation systems 	Orange	
	200	<ul style="list-style-type: none"> Cathodic protection systems 	Medium Green	

APPLICATIONS

The various formulations of Conducrete® allow it to be used in a very wide range of applications across virtually every industrial sector. Key application areas include:

- Lightning protection and grounding systems;
- Electrical protection and grounding systems, especially where personnel safety is of paramount concern;
- Electrical noise mitigation and suppression systems;
- Cathodic protection (CP) systems, especially impressed current anti-corrosion systems for metal pipelines;
- AC mitigation systems for pipelines co-located with electrical transmission lines in utility and transportation corridors;
- Grounding or deep anode CP systems for environmentally sensitive areas with high risk of aquifer cross-contamination.

BENEFITS

- Versatile grounding product provides exceptional electrical and high energy dissipation performance when incorporated into horizontal and vertical electrodes;
- Significantly reduces incidence of copper theft, thus lowering service outages and maintenance costs;
- Significantly reduces the corrosion of copper grounding components, allowing Conducrete® electrodes to provide reliable and consistent electrical performance over the entirety of their long lifetimes – which can extend to 25 years and beyond;
- Significantly reduces maintenance overhead costs as Conducrete® electrodes are virtually maintenance-free over their functional lifetime. There are NO hydration or salt replacement requirements with Conducrete®
- Easy and flexible installation in either powder or slurry form;
- Impermeable and pH neutral when setup, giving Conducrete® a very low environment impact and making it viable for use where underground aquifer are present. No salts will leach into, or contaminate the soil.

CONDUCRETE® PRODUCT ORDERING OPTIONS

Conducrete® products are offered in several formulations to meet the technical requirements and environmental conditions of different applications. In addition, Conducrete® products are available in a number of package options to better accommodate different market factors or installation requirements. Use the product ordering option tables below to specify the Conducrete® product that best meets your needs.

CONDUCRETE® PRODUCT FAMILY CODE (see Option Tables A and B)	APPLICATIONS OPTIONS CODE (see Applications Options Table A)	PACKAGING OPTIONS CODE (see Packaging Options Table B)	FUTURE USE
xx	– aaa	– pp	– ff

TABLE A: CONDUCRETE® APPLICATIONS OPTIONS

PRODUCT FAMILY CODE (xx)	OPTION CODE (aaa)	DESCRIPTION AND APPLICATIONS	INSTALLATION ^[1]
DM	100	Formulated for use in electrical and lightning protection grounding systems utilizing horizontal electrodes, where it is designed to resist cracking. This special formulation absorbs moisture from the soil to set up over two to three weeks.	Dry
	200	Formulated for use in cathodic protection, and electrical and lightning protection grounding systems installations utilizing vertical electrodes in non-corrosive soil conditions. The activation time is 30 days.	Slurry
	300	Formulated for use in AC mitigation systems to be installed using automated machinery. This formulation is specially mixed to provide a smoothly flowing powder that resists clogging automated machinery.	Dry

1. In all cases, the Conducrete® material is supplied dry. Slurry mixes are prepared on-site with fresh, salt-free water according to industry standard guidelines.

TABLE B: CONDUCRETE® PACKAGING OPTIONS

PRODUCT CODE (xx-aaa)	PKG OPTION CODE (pp)	BAG WEIGHT		BAG SIZE (W X H X D)		BAG CONSTRUCTION	BAG OR BAG TEXT COLOR
		KG	LBS	CM	INCHES		
DM-100	10	11	25	33 x 46 x 11	13 x 18.1 x 4.3	Multi-ply sandwich ^[1] with handle	Dark Blue
	20	25	55	45 x 54 x 13	17.7 x 21.3 x 5.1	Multi-ply sandwich ^[1]	
	30	907	2000	117 x 93 x 93	46 x 36.5 x 36.5	Single-ply polypropylene ^[2]	
DM-200	21	25	55	45 x 54 x 13	17.7 x 21.3 x 5.1	Multi-ply sandwich ^[1]	Medium Green
	31	907	2000	117 x 93 x 93	46 x 36.5 x 36.5	Single-ply polypropylene ^[2]	
DM-300	22	25	55	45 x 54 x 13	17.7 x 21.3 x 5.1	Multi-ply sandwich ^[1]	Orange
	32	907	2000	117 x 93 x 93	46 x 36.5 x 36.5	Single-ply polypropylene ^[2]	

1. Bag constructed of 3 plies – 2 x outer plies of 80 gr paper, with inner ply of 0.5 mil HDPE – High Density Polyethylene Plastic
2. Bag constructed of a single ply of woven polypropylene with UV protection



PRODUCT SHIPPING

PACKAGE OPTION CODE	SHIPPING METHODS AND DETAILS									
	PALLET [1,3]			TRUCKLOAD				40' CONTAINER		
	NUMBER OF BAGS	NET WEIGHT [2]		NUMBER OF BAGS	NUMBER OF PALLETS	NET WEIGHT [2]		NUMBER OF BAGS	NET WEIGHT [2]	
		KG	LBS			KG	LBS		KG	LBS
1X	75	850	1,875	1650	22	18,710	41,250	2000	20,000	44,000
2X	35	875	1,930	770	22	19,250	42,440	800	20,000	44,000
3X	N/A	N/A	N/A	20	N/A	18,140	40,000	20	18,140	40,000

1. Pallets are heat-treated and ISPM-15 compliant for use within North America and to international destinations
2. Approximate net weight of product only – numbers do not include weight of pallets or containers
3. Pallet option is not available for the 2000 lb supersack bags



SAE CONDUCRETE® FAMILY

CONDUCRETE® DM100
GROUNDING

CONDUCRETE® DM200
CATHODIC PROTECTION

CONDUCRETE® DM300
AC MITIGATION

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AEL ANODE[®] FOR CATHODIC PROTECTION

AEL ANODE[®] PRODUCT FEATURES

Advanced extended-life AEL Anodes[®] offer impressed current cathodic protection systems premium features and capabilities that improve bottom line financial performance by reducing maintenance and operating costs and improving system performance over traditional anodes:

- AEL Anodes[®] are pre-cast assemblies designed for reliable, extended service life CP systems
- AEL Anode[®] core utilizes mixed metal oxide (MMO) technology for optimal transfer of impressed current CP energy into the body of the anode
- AEL Anode[®] body is formed from a cast block of conductive and impermeable proprietary material that protects the anode core against corrosion and provides a large, low energy density surface to efficiently transfer energy electronically to the anode backfill layer
- AEL Anode[®] connection to the CP rectifier is through pre-assembled dual-jacketed Halar[®] insulated copper cable to maximize the operational lifetime of the anode and ensure sufficient current carrying capacity
- The Halar[®] cable is factory bonded to the anode using a double compression crimp and sealed in a block of resin to provide maximum robustness and prevent water penetration, further improving anode performance and longevity
- Available in different options for use in different soil conditions
- Available in a variety of current carrying capacities
- Available In Long 2 x Normal, or Extreme 3 x Normal Life versions
- Available with a variety of economical standard electrical cable lengths or with client specific custom cable lengths
- AEL Anodes[®] can be assembled in parallel multi-anode systems to increase CP system impressed current capacity
- AEL Anodes[®] can be utilized in both vertical or horizontal anode beds
- AEL Anode[®] can be used with a variety of backfill and cap materials, though the use of SAE impermeable long-life backfill is recommended for maximum operational performance
- AEL Anode[®] do not require centering devices for installation

AEL ANODE[®] PRODUCT FAMILY

The family of advanced, long-life AEL Anodes[®] is currently offered in two major variations, according to the soil conditions in which they will be installed and operated:

PRODUCT FAMILY		KEY APPLICATIONS	DESCRIPTION
AEL	100	<ul style="list-style-type: none"> • Impressed current cathodic protection systems • Deep or horizontal CP anodes beds • Pipeline protection • Refineries protection 	AEL-100 anodes are designed for use in normal, non-saline, non-corrosive soils. The anode casings are molded from a specially formulated conductive material, DM-200 Conducrete [®] , that provides efficient electronic energy transfer to the backfill column.
	200	<ul style="list-style-type: none"> • Tank farm protection • Protect any metal infrastructure against electrolytic corrosion • Petroleum industry • Municipal water and sewage treatment facilities 	AEL-200 anodes are designed for use in high-salinity and corrosive soils. To provide additional protection in these harsh soil environments, the anode casings are molded from an impermeable, non-cementitious and carbonaceous material, SG-002, developed by SAE Inc. Like AEL-100 anodes, energy transfer to the backfill column is electronic.



BENEFITS

- Longer anode life offers significantly lower maintenance and replacement costs
- Available with standardized, fixed-length electrical cables to reduce costs and delivery times
- Available in several current and longevity ratings to fit a wide variety of application requirements
- AEL Anode[®] design is water impermeable, reducing anode corrosion and extending anode lifetime
- AEL Anode[®] design facilitates electronic energy transfer by lowering the energy density of the anode surface, thereby reducing out-gassing during operation
- AEL-200 offers an effective solution for high salinity soil conditions that extends performance and service life well beyond those of traditional anode products
- Simplified installation, as centering devices are not required
- Conforms to applicable NEC and CEC electrical code requirements

AEL ANODE[®] ORDERING OPTIONS

AEL nodes[®] are available in a variety of configurations to fit the widest range of application. Please specify the AEL Anode[®] options that meet your requirements using the option code tables below.

ANODE CLASS (Advanced Extended Life)	APPLICATIONS CODE (see Applications and Soil Options Table A)	PERFORMANCE CODE (see Performance Options Table B)	ELECTRICAL CABLE CODE (see Electrical Cable Options Table C)	CABLE LENGTH IN METRES (specified only if Cable Option 'yC' is selected)
AEL	- aaa	- pp	- ee	- xx

TABLE A: APPLICATION OPTIONS

OPTION CODE (aaa)	DESCRIPTION	ANODE CAST MATERIAL
000	Solid core anodes for client specific applications ^[1]	N/A
100	Anode for use in normal, low salinity, low corrosive soil conditions	DM-200 ^[2]
200	Anode for use in high salinity, highly corrosive soil conditions	SG-002 ^[3]
<ol style="list-style-type: none"> 1. Available by special order only. Extra costs and delivery constraints may apply. Please contact SAE Inc. for details on custom options available. 2. Conducrete[®] conductive cement formulated for use in cathodic protection (CP) anode beds. 3. Impermeable non-cementitious and carbonaceous material formulated for use in high salinity soil conditions. 		



TABLE B: PERFORMANCE OPTIONS

OPTION CODE (pp)	DESCRIPTION	PERFORMANCE PARAMETERS	
		CURRENT RATING (AMPS)	RELATIVE LONGEVITY ^[1] FACTOR
00	Long life, low current anode rated at 5A	5	2 x Normal
01	Long life, medium current anode rated at 8A	8	2 x Normal
02	Long life, high current anode rated at 12A	12	2 x Normal
10	Extreme life, low current anode rated at 5A	5	3 x Normal
11	Extreme life, medium current anode rated at 8A	8	3 x Normal
12	Extreme life, high current anode rated at 12A	12	3 x Normal

1. Estimated operational lifetime when installed in an EnivrAnode[®] CP system. Industry normal anode lifetimes are considered to be ≤ 20 years. Improper installation or overdriving beyond rated limits will reduce life expectancy.

TABLE C: ELECTRICAL CABLE OPTIONS

OPTION CODE (ee)	DESCRIPTION	ELECTRICAL CABLE PARAMETERS		
		SIZE	STANDARD LENGTHS	
		AWG	METRES	FEET
40	Halar [®] Double Insulated Cable	#8	10	32.8
41	Halar [®] Double Insulated Cable	#8	30	98.4
42	Halar [®] Double Insulated Cable	#8	50	164.0
43	Halar [®] Double Insulated Cable	#8	70	229.7
44	Halar [®] Double Insulated Cable	#8	90	295.3
4C-xx	Halar [®] Double Insulated Cable Customer specified cable length where "xx" is given in metres	#8	xx	TBD

PRODUCT SPECIFICATIONS AND SHIPPING

PRODUCT FAMILY	DIMENSIONS				WEIGHT OF ANODE WITHOUT ELECTRICAL CABLE		WEIGHT OF ELECTRICAL CABLE (PER METRE)	
	DIAMETER		LENGTH		KG	LBS	KG	LBS
	METRES	INCHES	METRES	FEET				
AEL-100	0.1	4	1.8	6	22.7	50		
AEL-200	0.1	4	1.8	6	22.7	50		

SHIPPING AEL ANODES[®] ARE SHIPPED WITH THEIR ELECTRICAL CABLES PRE-ATTACHED





ECS-1000 ENVIRANODE® CATHODIC PROTECTION SYSTEM*

PRODUCT OVERVIEW

The ECS-1000 EnvirAnode® CP System for impressed current cathodic protection applications is a premium solution where high performance, long life and environmental compliance are required. With double the life expectancy of current CP solutions, exceptional performance over its lifetime, lower operational costs and unique environmental characteristics that make it the only regulatory approved CP system for use where aquifer quality is threatened, the ECS-1000 EnvirAnode® is *NOT* your grandfather's CP technology.

To guarantee compliance to environmental regulations and performance specifications, technicians certified by SAE must install or supervise the installation of the ECS-1000 EnvirAnode® CP System.

IF IT'S NOT CERTIFIED, IT'S NOT AN ENVIRANODE®!

PRODUCT FEATURES

- The ECS-1000 EnvirAnode® CPS is constructed from one or more SAE extended-life AEL Anodes®, embedded in DM-200 Conducrete®, an impermeable, long-life conductive backfill
- The potent combination of AEL Anodes® with Conducrete® backfill provides a large surface area over which to effectively dissipate the CP energy into the soil
- Large anode surface area reduces the circumferential surface energy density, eliminating the production of gases by electrolysis to the extent that out-gassing vent pipes are not required
- Once the EnvirAnode® Conducrete® column has set up, it provides an impenetrable barrier to the migration of water, eliminating aquifer cross contamination and maintaining the quality of critical water resources
- The Conducrete® column provides additional protection around the anode elements against water penetration and corrosion, further extending the operational lifetime of the EnvirAnode
- EnvirAnode® uses a highly efficient electronic energy transfer process, rather than electrolytic action, to dissipate energy into the soil, thus providing stable electrical operating characteristics over an extremely long operational lifetime
- Highly efficient electronic energy transfer process reduces operational costs
- Available in operating lifetimes of 2x and 3x normal CP anode systems, halving maintenance and replacement costs
- EnvirAnode® is environmentally neutral once installed and set up – no salts will leach into, or contaminate the soil
- Can be deployed in both vertical and horizontal anode beds
- Available in a version for high-salinity, corrosive and harsh soil conditions
- Can be utilized in environmentally sensitive locations and in deep anode beds where underground aquifers are present
- Approved for use by regulatory agencies in Texas and Kansas
- Engineering design services to ensure the optimal functionality of EnvirAnode® CP systems to client technical specs and site soil conditions
- Installation and supervisory services to provide efficient deployment and certification of EnvirAnode® CP Systems for compliance to environmental regulations
- SAE offers specialized EnvirAnode® certification training to client technicians and engineers

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* PATENT PENDING

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REGULATORY APPROVALS (ENVIRONMENTAL)

- Railroad Commission of Texas (RRC)
- State of Kansas (Kansas Corporation Commission)



APPLICATIONS

The SAE EnvirAnode® CP Systems are designed to provide low environmental impact solutions for impressed current CP deep anode bed systems that must be located in sensitive areas where the preservation and protection of soil and underground water aquifer resources is critical. Quite apart from its environmental advantages, the EnvirAnode® technology also offers superlative electrical performance and extended operational lifetimes over traditional cathodic protection solutions, qualities will reflect positively on operations and the business bottom line. EnvirAnode® CP Systems are recommended for use in:

- Petroleum industry: pipelines, refineries, tank farms etc
- Municipal and private sector water and sewage treatment plants, etc
- Environmentally sensitive or restricted areas that require deep anode beds otherwise prohibited by traditional CP systems
- Remote or limited access areas where maintenance and replacement costs are particularly high
- Any deep anode or horizontal bed CP applications that require full-custom design and engineering
- CP applications located in high salinity or other harsh soil conditions

BENEFITS

EnvirAnode® CP Systems offer industry and municipalities unique technical and business solutions to their cathodic protection requirements with:

- Fully customized EnvirAnode® CP Systems that can be engineered and supplied to effectively satisfy virtually any operating parameter requirement or soil condition
- Low impact, environmentally viable CP solutions that are suitable for deep anode beds where aquifers, environmental regulations and constraints are paramount and preclude the use of traditional CP systems
- Environmentally neutral and sustainable solutions that prevent cross-contamination of underground aquifers and eliminate the soil and air pollution inherent to traditional CP systems
- Superlative operating performance that ensures positive ROI and bottom-line financial results over traditional CP systems
- Consistent and stable electrical performance over the life of the CP anode bed, reducing long term operating costs
- Extended operational lifetimes that are twice those of traditional CP systems, significantly reducing maintenance and replacement costs
- A simplified installation process inherent to the EnvirAnode® technology that eliminates centering devices and vent pipes, thereby accelerating and reducing deployment costs
- An effective answer to landowner concerns, reducing liability risks associated with delays and legal interventions
- A CP solution that eliminates future abandonment issues
- Supported with a full range of SAE professional services that include: engineering, installation and project management
- Certified EnvirAnode® CP system installations conform to NEC and CEC electrical codes and environmental regulations



EnvirANODE® CATHODIC PROTECTION

ADVANCED ENVIRANODE® TECHNOLOGY VS TRADITIONAL CATHODIC PROTECTION

COMPARE ENVIRANODE® PERFORMANCE TO TRADITIONAL SYSTEMS

APPLICATION OR PERFORMANCE CHARACTERISTIC	ECS-1000 ENVIRANODE® CPS WITH CONDUCRETE® BACKFILL ^[1]		TRADITIONAL CP SYSTEM WITH MMO ANODE AND COKE BREEZE BACKFILL ^[2]
	LONG LIFE	EXTREME LIFE	
Application Areas			
Deep anode beds	Yes		Restricted ^[3]
Horizontal anode beds	Yes		Restricted ^[3]
Dry terrain without underground aquifers	Yes		Yes
Environmentally sensitive terrain with underground aquifers	Yes		No
High salinity, corrosive or harsh soil conditions	Yes		System Performance and Longevity Reduced
CP Construction Details			
Small diameter bore hole	10" (25.4 cm)		10" (25.4 cm)
Large diameter bore hole	12" (30.5 cm)		12" (30.5 cm)
Anode centering devices required	No		Yes
Risk of bore hole wall collapse over time	No		Yes
Environmental Performance Risks			
Aquifer contamination from surface water	None		Yes ^[4]
Cross-contamination of underground aquifers	None		Yes
Out-gassing	None ^[5]		Yes
Regulatory approval for use in deep anode beds where there is a risk of aquifer cross-contamination	Yes ^[6]		No
EnvirAnode Installations Certified by SAE	Yes ^[1]		No
Expected CP System Longevity			
With MMO tubular anodes	N/A		Normal ^[7]
With long life AEL Anodes®	2 x Normal	N/A	N/A
With extreme life AEL Anodes®	N/A	3 x Normal	N/A
Electrical Properties			
Energy transfer mechanism to the soil	Electronic		Predominantly Electrolytic
Anode bonding to backfill column	Molecular		Granular
Backfill bonding	Molecular		Granular
Electrical Performance over Design Lifetime			
Short term (5 years or less)	Excellent		Good
Medium term (between 5 and 15 years)	Excellent		Good to Poor
Medium long term (between 15 and 25 years)	Excellent		Poor
Long term (between 25 and 40 years)	Excellent to Good	Excellent	N/A
Very long term (40 years and beyond)	N/A	Excellent to Good	N/A
<ol style="list-style-type: none"> Conducrete® DM-200 for Cathodic Protection Systems. For SAE certification, no coke breeze, salt, clay or other foreign materials can be mixed with the Conducrete® DM-200 backfill, as these will reduce the longevity and performance characteristics of the EnvirAnode® Typically MMO tubular anode with Calcinated Petroleum Coke Breeze backfill, sometimes mixed with clay, salts or other materials Cannot be used if anode will pass through underground aquifers Risk that surface water could contaminate underground aquifers via the vent pipe No out-gassing vent pipe required See list of regulatory agencies offering ESC-1000 EnvirAnode® CP System certifications below Normal CP lifetime is considered to be ≤ 20 years, though actual lifetime and effective performance will be reduced when installed in high salinity, corrosive and other harsh soil environments or if overdriven beyond its rated design limits 			

ENVIRANODE® CP SYSTEM PRODUCT ORDERING OPTIONS

EnvirAnode® CP Systems are designed and built for your specific application and geographic location. Use the product ordering option codes and configuration tables below to specify the characteristics of the EnvirAnode® CP System that meets your technical requirements.



For EnvirAnode® CP System support services, please refer to the service descriptions below or contact SAE directly.

ENVIRANODE® CP SYSTEM PRODUCT FAMILY CODE	APPLICATIONS OPTIONS CODE (see Applications Options Table A)	PERFORMANCE OPTIONS CODE (see Performance Options Table B)	SERVICES OPTIONS CODE (see Service Options Table C)
ECS – 1000	– aa	– pp	– sss

TABLE A: ENVIRANODE® APPLICATION OPTIONS

OPTION CODE (aa)	APPLICATION AND/OR SOIL CHARACTERISTIC ^[1] PARAMETER DESCRIPTIONS	ANODE ELEMENT RECOMMENDED	BACKFILL COLUMN MATERIAL RECOMMENDED
00	pH neutral soil conditions	AEL-100	Conducrete® DM-200
10	Alkaline soil conditions	AEL-100	Conducrete® DM-200
1. Site soil characteristics and profile, including salinity, pH, resistivity and underground aquifer locations are obtained from geo testing results used for the engineering design of each EnvirAnode® CP System			

TABLE B: ENVIRANODE® PERFORMANCE OPTIONS

OPTION CODE (pp)	PERFORMANCE OPTIONS	APPLICATIONS	ENVIRANODE® LONGEVITY ^[1]
10	Long Life	Economical solution ideal for high performance requirements over normal expected lifetimes	2 x Industry Normal Life
20	Extreme Life	Premium solution for extended life, high performance systems; remote sites with difficult or expensive access; or sites where terrain disruptions must be minimized for ecological or environmental reasons	3 x Industry Normal Life
1. Estimation based on proper, certified installation, and when operated within rated limits			

TABLE C: SAE ENVIRANODE® SUPPORT SERVICE OPTIONS

OPTION CODE (sss)	SUPPORT SERVICES ^[1]				
	GEO TESTING	ENGINEERING DESIGN ^[5]	DEPLOYMENT	TECHNICAL SUPERVISION	SAE CERTIFICATION
000	NO SUPPORT SERVICES				
010				● [4]	
011				● [4]	●
030			● [3]	●	
031			● [3]	●	●
040		● [2]			
051		● [2]		●	●
071		● [2]	●	●	●
130	●		● [3]	●	
131	●		● [3]	●	●
140	●	●			
150	●	●		●	
151	●	●		●	●
171	FULL TURN-KEY SERVICES				

1. Select the option code for the combination of EnvirAnode® services required from SAE.
2. EnvirAnode® engineering design will be based on geo test soils data provided by the client.
3. EnvirAnode® installation will comply with client engineering design and component order.
4. SAE will provide technical supervision to client during installation to ensure EnvirAnode® CP Systems installations meet the regulatory standards that apply to the EnvirAnode® technology.
5. Engineering design work includes the preparation of the EnvirAnode® components order.



TABLE D: SAE ENVIRANODE® SUPPORT SERVICE DESCRIPTIONS

SUPPORT SERVICE	DESCRIPTION
Geo Testing	<p>The basic soils testing, data collection and analysis required to determine soil profile and resistivity values, including aquifer locations and depths. In difficult or ecologically sensitive sites, a test bore may be drilled to obtain a more accurate profile.</p> <p>Deliverables:</p> <ul style="list-style-type: none"> A soils report that includes the raw test results collected, soil profile and resistivity, underground aquifer locations and data analysis and significance to the CP anode bed design <p>Rationale:</p> <ul style="list-style-type: none"> The design quality and overall performance of any CP system is directly dependent on the quality of the soils data Detailed soils and aquifer data can be critical in environmentally sensitive areas, or where landowner interests may become paramount. Detailed soils data ensures an appropriate CP design.
Engineering Design	<p>The engineering, design and computer modeling work required to produce an EnvirAnode® CP System design that incorporates the soils data and technical objectives of the client. Various factors included in the final EnvirAnode® design include:</p> <ul style="list-style-type: none"> Depth (or length for horizontal anodes) and diameter of anode bore hole Number of anode elements required, with anode element type, current rating and vertical position within bore hole Recommended operating impressed drive currents <p>Deliverables:</p> <ul style="list-style-type: none"> A design report that specifies the complete configuration of the EnvirAnode®, the Bill of Materials (BOM) required to construct it, along with all recommended operational parameters to ensure optimal performance over the design lifetime.
Deployment	<p>All work required to install and test the completed EnvirAnode® CP System in the field, including:</p> <ul style="list-style-type: none"> Inventory check of EnvirAnode® components shipment(s) Contract local equipment and personnel needed for installation (eg: drill rigs) Field planning, installation and construction supervision Acceptance testing of completed EnvirAnode® CP System Project management services related to installation work <p>Deliverables:</p> <ul style="list-style-type: none"> Installed and tested EnvirAnode® CP System ready to be commissioned and turned up by client Final report covering the information and testing, complete with any necessary test certificates. The soils and engineering reports are included in this final report only if the Geo Testing and Engineering Design services have also been contracted.
Technical Supervision	<p>Where the client undertakes the installation themselves, or subcontracts the work to a third party, SAE can provide technical supervision for the EnvirAnode® CP System deployment to ensure correct installation and eligibility for SAE Certification. This service is automatically included when SAE is contracted to do the installation.</p> <p>Deliverables:</p> <ul style="list-style-type: none"> Technical assistance and compliance verification for EnvirAnode® installations
SAE Certification	<p>EnvirAnode® CP System installations completed in conformance with SAE standards and in the presence of a certified technician (trained by SAE), are certified to show they meet the regulatory standards under which the EnvirAnode® technology was approved.</p> <p>Deliverables:</p> <ul style="list-style-type: none"> SAE Certificate of Compliance to EnvirAnode® Regulatory Approval.
Full Turn-key	<p>SAE Inc offers full turn-key services that include all services and deliverables described above – ideal for clients looking to take delivery of a complete and tested system.</p>

INSTALLATION & OPERATION

EnvirAnode® CP systems are installed using the same equipment and techniques as traditional CP systems. However:

- EnvirAnode® CP systems do not require anode centering devices (if using Conducrete® backfill)
- EnvirAnode® CP systems do not require out-gassing vent pipes (if using Conducrete® backfill)
- EnvirAnode® CP systems can be driven at lower voltages to obtain the same effective performance as traditional systems
- Overdriving any CP system above its design current ratings will shorten the effective operating life of the anode



EKT ENVIRANODE® CATHODIC PROTECTION KIT PACKAGES

PRODUCT OVERVIEW

The EKT EnvirAnode® CP kit packages offer a selection of predefined cathodic protection anode bed configurations for impressed current CP applications. Available with different impressed current ratings and pre-determined physical geometries, the EnvirAnode kits provide a premium, efficient cathodic protection solution where high performance, long life and environmental compliance are required. With double the life expectancy of current CP solutions, exceptional performance over its lifetime, lower operational costs and unique environmental characteristics that make it the only regulatory approved CP system for use where aquifer quality is threatened, the EKT EnvirAnode® kits also offer an innovative, efficient and cost effective way to solve a variety of typical cathodic protection applications.

To guarantee compliance to environmental regulations and performance specifications, technicians certified by SAE must install or supervise the installation of the EKT EnvirAnode® CP kit.

APPLICATIONS

EKT EnvirAnode® CP kit packages are designed to provide standardized solutions for quickly deploying impressed current cathodic protection anode bed systems in the petroleum industry and municipal facilities. They can be installed in any CP application with current requirements below or equal to the EKT kit current rating, including:

- Petroleum industry: pipelines, refineries, tank farms etc
- Municipal and private sector water and sewage treatment plants, etc
- Environmentally sensitive or restricted areas that require deep anode beds otherwise prohibited by traditional CP systems

The EKT-25 and EKT-50 kits, when installed by EnvirAnode® certified technicians, are approved for use in CP systems located in environmentally sensitive areas or areas facing severe technical constraints due to the presence of underground aquifers.

BENEFITS

EKT EnvirAnode® CP kits offer cost sensitive industry and municipalities unique solutions to their cathodic protection requirements, notably:

- Standardized EnvirAnode® kits will work over a broad range of operating currents, and are expected to satisfy close to 80% of typical CP technical requirements, eliminating the need for custom design costs
- Available for substantial price discounts over individual site-customized CP solutions
- Available with much shorter lead times from the factory, meaning faster deployments
- Provide an environmentally viable solution where environmental regulations and constraints are paramount and preclude the use of traditional CP anode bed systems
- Superlative operating performance that ensures positive ROI and bottom-line financial results over traditional CP systems
- Consistent and stable electrical performance over the life of the anode bed, reducing long term operating costs
- Extended lifetimes twice those of traditional CP systems, significantly reducing maintenance and replacement costs
- Complete kits provide all materials needed, while offering the simplified installation and benefits inherent to the EnvirAnode® technology by eliminating the centering devices and vent pipes that are not required
- EKT EnvirAnode® CP kits conform to applicable NEC and CEC electrical code requirements



EKT ENVIRANODE® KIT – CONTENTS

EKT EnvirAnode® CP kits are provided with all materials necessary to complete the CP anode installation. Kit contents and quantities are given in the table below:



ENVIRANODE® KIT CONTENTS

ITEM N°	SUB-ITEM	CONTENT ITEM AND DESCRIPTION ^[4]	ENVIRANODE® KIT ^[1]		UNITS OF MEASURE
			EKT-25	EKT-50	
			ITEM QTY	ITEM QTY	
01	-	AEL Anode® elements connected to a length of cable sufficient to reach top of bore	10	20	AEL Anodes®
02	-	Distribution box to rectifier bus cable (sized for kit current)	6	6	Metres
03	-	Distribution box and bus bar	1	1	Packaged Kit
04	-	PVC wellhead casing with (5 metres)	5	5	Metres
05	01	Backfill for 10 inch bore: Conducrete® (amount specified includes 10% extra to account for variations in the bore diameter)	120	208	25kg Bags
	02	Backfill for 12 inch bore: Conducrete® (amount specified includes 10% extra to account for variations in the bore diameter)	170	300	25kg Bags
06	11	Cap for 10 inch bore: Bentonite ^[2]	40	40	25kg Bags
	21	Cap for 10 inch bore: Portland Cement ^[2,3]	40	40	25kg Bags
	31	Cap for 10 inch bore: Conducrete® DM-200 ^[2]	40	40	25kg Bags
	12	Cap for 12 inch bore: Bentonite ^[2]	52	52	25kg Bags
	22	Cap for 12 inch bore: Portland Cement ^[2,3]	52	52	25kg Bags
	32	Cap for 12 inch bore: Conducrete® DM-200 ^[2]	52	52	25kg Bags
07	-	Assorted hardware package	1	1	Packaged Kit

1. Volumetric amounts include an additional 10% of material.
2. Cap is assumed to have a fixed depth of 20m.
3. Portland cement cap volumes are calculated without aggregate.
4. Kit components and quantities are subject to change without notice.



EnvirANODE® CP KIT PACKAGES

ENVIRANODE® KIT PRODUCT ORDERING OPTIONS

EKT EnvirAnode® CP kits are predefined and built for typical cathodic protection applications, and are available for a variety of impressed current capacities. Use the product ordering option codes in the tables below to specify the EKT EnvirAnode® CP kit that meets your technical requirements.

EKT EnvirAnode® CP kits are provided as part kits only, without support services. If services are required, please refer to the EnvirAnode® CP System page or contact SAE directly.

ENVIRANODE® CP KIT CODE (see Current Rating Options Table A)		PHYSICAL GEOMETRY OPTIONS CODE (see Applications Options Table B)		APPLICATIONS OPTIONS CODE (see Applications Options Table C)		FUTURE USE		
EKT	-	CC	-	ggg	-	aa	-	ff

TABLE A: ENVIRANODE® KIT – CURRENT RATING OPTIONS

OPTION CODE (cc)	TOTAL IMPRESSED CURRENT RATING (AMPS)
25	25
50	50

TABLE B: ENVIRANODE® KIT – PHYSICAL GEOMETRY OPTIONS

OPTION CODE (ggg)	N° OF AEL ANODE® ELEMENTS	AEL ANODE® WIRE LENGTHS				CAP MATERIAL (CAPS HAVE A FIXED DEPTH OF 20 M)	BORE HOLE GEOMETRY					
		METRES		FEET			DIAMETER (INCHES)	DEPTH (METRES)	DEPTH (FEET)			
101	10	46.0	68.9	151	226	NATIVE SOIL	10	91.4	300			
102		50.6	73.5	166	241		12					
111		55.2	78.0	181	256	BENTONITE	10					
112		59.7	82.6	196	271		12					
121		64.3	87.2	211	286	PORTLAND CEMENT	10					
122							12					
131						CONCRETE DM-200	10					
132							12					
301		20	64.3	110.0	211	361	NATIVE SOIL			10	152.4	500
302			68.9	114.6	226	376				12		
311	73.5		119.2	241	391	BENTONITE	10					
312	78.0		123.7	256	406		12					
321	82.6		128.3	271	421	PORTLAND CEMENT	10					
322	87.2		132.9	286	436		12					
331	91.7		137.5	301	451	CONCRETE DM-200	10					
332	96.3		142.0	316	466		12					
	100.9		146.6	331	481							
	105.5		151.2	346	496							

TABLE C: ENVIRANODE® KIT – APPLICATION OPTIONS

OPTION CODE (aa)	APPLICATION AND/OR SOIL CHARACTERISTIC ^[1] PARAMETER DESCRIPTIONS	AEL ANODE® ELEMENT
oo	Low salinity, non-corrosive soil conditions	AEL-100-00
1. Site soil characteristics, including salinity, pH and resistivity are determined from geo testing.		

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- EnvirAnode® CP systems do not require out-gassing vent pipes (if using Conducrete® backfill)
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