



# FUSION BONDED EPOXY

*PROTECTIVE COATING*



## *About us*

PEKA CHEMIE Company was founded in March, 1995 with the aim of producing different kinds of powder coatings.

As the biggest producer of powder coatings based in Iran, PEKA CHEMIE has been supplying the highest quality of powder coatings including decorative, industrial and fusion bonded epoxy.

PEKA CHEMIE, owing to its highly developed technology and technical experts in the field, is the stand-alone producer of fusion bonded epoxy in Iran.



## Introduction

### *Peka Chemie Co.*

Corrosion and degradation of the water, oil and gas transportation steel pipelines are among serious problems in various industries. Repairing or replacing of destroyed pipes is very costly. One of the most effective methods for corrosion protection of the pipelines is the application of pipe coatings for the cathodic protection process. Steel pipelines covered with protective coats must be mechanically resistant during transportation, working operations and resistant to the destructive effects of the soil. Also, when cathodic protection is carried out on a coated pipeline, the coating can be delaminated from the surface through destructive conditions and cathodic reactions. In this case, the cathodic disbonding extends radially from the defects in the coating.

Therefore, study on the production of powder coatings with a significant resistance to corrosion and cathodic disbondment have always been considered by researchers and experts working in PEKA CHEMIE industrial company. FBE is a group of epoxy powder coatings that is used as a protective coating for steel pipelines, reinforcing steel bars due to their anti-corrosion and barrier properties.



# *Peka-Pro Products*

PEKA CHEMIE Co.



## *Peka-Pro*

Peka-Pro is a series of fusion bonded epoxy products from PEKA CHEMIE that have excellent corrosion and cathodic disbondment resistance along with outstanding mechanical performance on steel pipelines and reinforced steel bars even in severe operating conditions.

***The portfolio of Peka-Pro products includes:***

- Peka-Pro SL (single layer FBE)
- Peka-Pro DL (Dual Layer FBE)
- Peka-Pro Pr (Primer for three layer and dual layer system)
- Peka-Pro Re (Rebar Coating)
- Peka-Pro IPC (Internal Pipe Coating for Potable Water)

***Substrate condition:***

For applying Peka-Pro products, steel pipelines should be blasted at Sa2 ½ degree defined by ISO3-11124, and also the average profile thickness should be 50 to 100 microns.



## *Peka-Pro SL*

*(Single Layer FBE)*

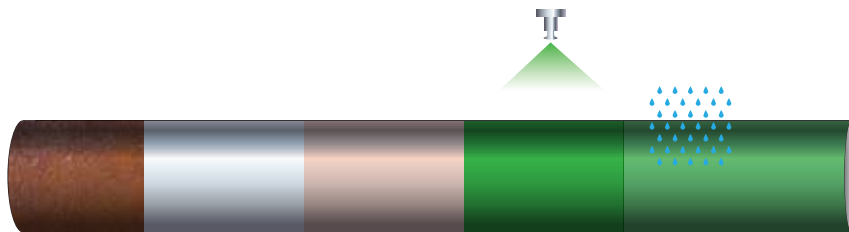
Peka-Pro SL includes a range of stand-alone fusion bonded epoxy coatings for steel pipelines. This is a cost-effective solution for oil, gas and water pipeline transportation systems. Film property meets CSA Z10-245.20 requirements.

**Advantages:**

- Excellent corrosion resistance
- High Cathodic disbondment resistance
- Excellent adhesion to metal substrates
- Very good mechanical performance even in high film thickness
- Cost effective solution for customers

**Application Process:**

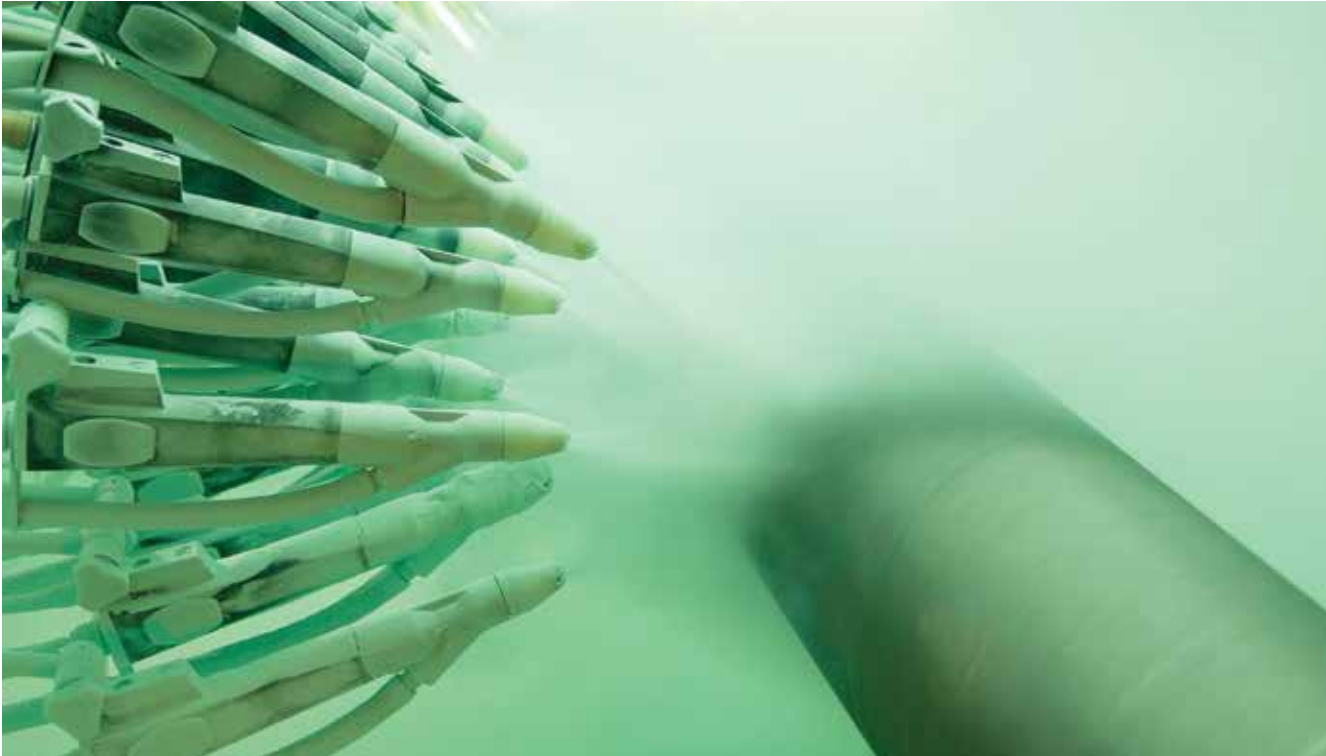
Picture and application method should be placed (300 -600  $\mu\text{m}$  and 210- 240°C)



1.	2.	3.	4.	5.
INCOMING RUST	BLAST CLEAN	HEAT 210-240°C	APPLY 300-600 $\mu\text{m}$	COOLING

**Technical features of Peka-Pro SL:**

PROPERTY	TEST METHOD	ACCEPTANCE CRITERIA	RESULTS
Color	----	----	Green
Gel time at 205°C	ISO 21809-02 (Clause A.3)	----	15-40 sec
Impact Resistance	ISO 21809-02 (Clause A.14)	$\geq 2$ J	Pass
Cathodic Disbondment	ISO 21809-02 (Clause A.9)	24 hours, -3.5V, 65 °C $\pm$ 3 °C $\leq$ 5 mm 28 days, -1.5V, 20 °C $\pm$ 3 °C $\leq$ 8 mm 28 days, -1.5V, 65 °C $\pm$ 3 °C $\leq$ 18 mm	1 - 4 mm 1 - 3 mm 6 - 9 mm
Flexibility @ - 30°C	ISO 21809-02 (Clause A.13)	No cracking @ 2° ppd	Pass
28 d hot-water adhesion 75 °C $\pm$ 3 °C	ISO 21809-02 (Clause A.16)	Rating of 1 to 3	Rating 1
Taber Abrasion Resistance	ISO 21809-02 ASTM D4060	100 mg	35 mg



## *Peka-Pro DL*

*(Dual Layer FBE)*

Dual layer FBE was introduced to the market in 1999 as an alternative to multi-layer system for directional drilling applications. In the dual layer FBE system two stand-alone FBE are applied one after the other on steel pipelines in order to protect steel pipelines from corrosion, cathodic disbondment and mechanical damage arising from laying, handling, backfilling and horizontal drilling. Dual Layer FBE is much more effective than Single Layer FBE.

Peka-Pro DL as a top coat and Peka-Pro Pr as a primer together show outstanding cathodic disbondment resistance and mechanical performance in severe operating conditions.



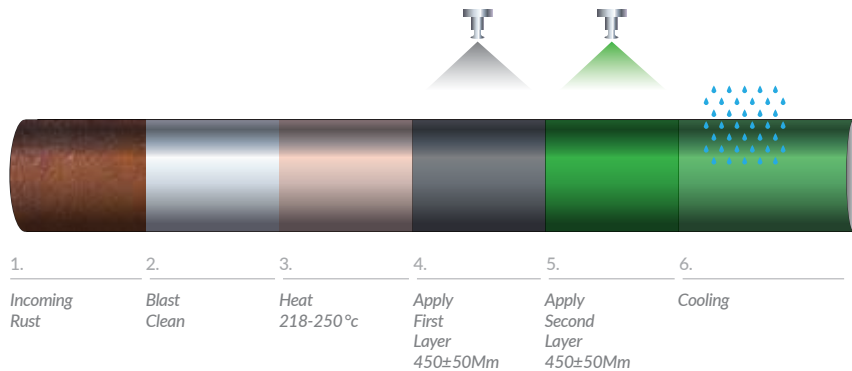
## *Peka-Pro DL from PEKA CHEMIE includes 4 systems according to required application:*

### *Peka-Pro DL-AR (Dual Layer Abrasion Resistance System)*

Pipes are exposed to mechanical stress during handling and transportation. Peka-Pro DL-AR guaranties optimum protection during laying, handling, backfilling and horizontal drilling. Because of its special formulation, Peka-Pro DL-AR enjoys excellent abrasion and gouge resistance to pipelines. Peka-Pro DL-AR meets IGS-M-TP026- and CSA Z10-245.20 system 2B requirements

#### *Application Process:*

*(Picture: 450 ± 50 µm Peka-Pro Pr, 450 ± 50 µm Peka-Pro DL-AR, 218- 250°C)*



### *Peka-Pro DL-AS (Dual Layer Anti-Slip System)*

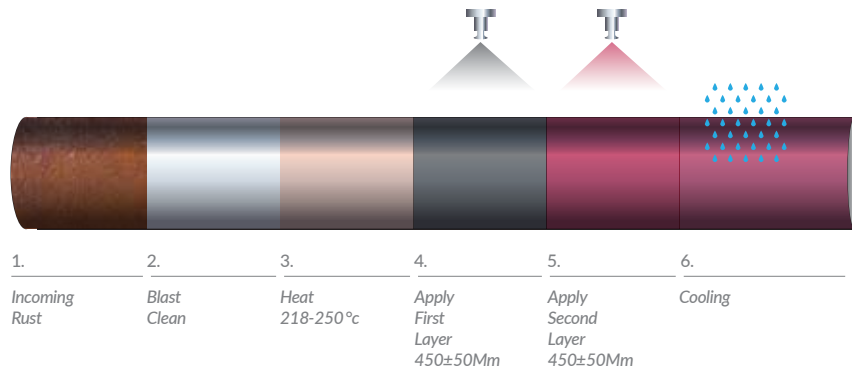
In some projects concrete weight coatings are applied on coated pipes. To prevent slipping, an anti-slip coating as a second layer is applied to pipes. It improves bond strength between pipe and concrete weight coating by increasing friction.

Peka-Pro DL-AS as the external anti-slip coating along with Peka-Pro Pr as a primer ensure excellent cathodic disbondment resistance and anti-slip properties.

The Peka-Pro DL-AS system meets CSA Z10-245.20 system 2C requirement.

#### *Application Process:*

*(Picture: 450 ± 50 µm Peka-Pro Pr, 150± 50 µm Peka-Pro DL-AS, 218- 250°C)*



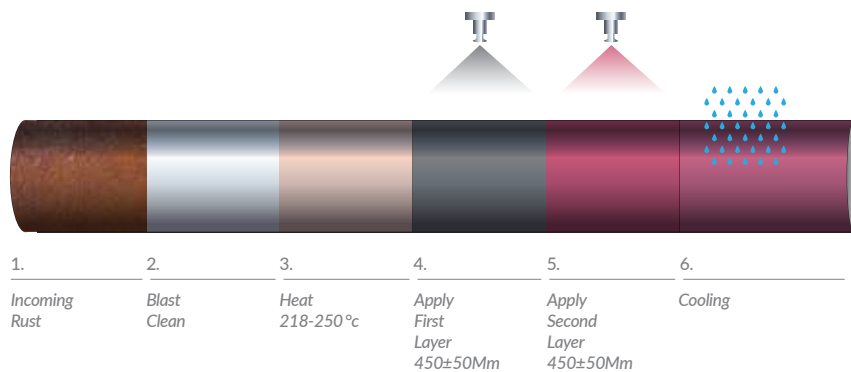


### *Peka-Pro DL-UF (Dual Layer Ultra Flexible System)*

During pipe laying some pipes should bend more than usual. Peka-Pro DL-UF as a second layer on Peka-Pro Pr certifies excellent flexibility even in high film thickness. Peka-Pro DL-UF provides flexibility (defined in CSA Z10-245.20 system 2A) beyond expectation.

#### *Application Process:*

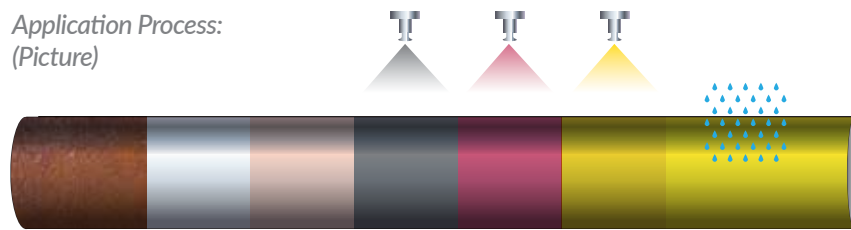
(Picture: 450 ± 50 µm Peka-Pro Pr, 450 ± 50 µm Peka-Pro DL-UF, 218 -250 °C)



### Peka-Pro DL-UV (Dual Layer UV resistance System)

In some conditions pipes are not buried and are exposed to sunlight. Since Epoxy coatings will chalk fairly quickly when exposed directly to sunlight, the upper layer of pipe coating must resist UV degradation. Peka-Pro DL-UV applied as a third layer on dual layer system in order to prevent UV degradation of dual layer system under sunlight exposure. Peka-Pro DL-UV is a UV resistant polyester.

Application Process:  
(Picture)



1.	2.	3.	4.	5.	6.	7.
Incoming Rust	Blast Clean	Heat 218-250 °c	Apply First Layer 450±50Mm	Apply Second Layer 450±50Mm	Apply Third Layer 50-70Mm	Cooling

### Technical features of Peka-Pro DL-AR and Peka-Pro DL-UF

PROPERTY	SPECIFICATION	ACCEPTANCE CRITERIA	RESULTS FOR PEKA-PRO DL-AR	RESULTS FOR PEKA-PRO DL-UF
Color	----	----	Green	Green
Gel time at 205°C	IGS-M-TP - 026	----	10-20 sec	10-20 sec
Impact Resistance	IGS-M-TP - 026	≥3.6 J	Pass	Pass
Cathodic Disbondment	IGS-M-TP - 026	48 hours, -3.5V, 80 °C ± 3 °C ≤ 5 mm 28 days, -1.5V, 20 °C ± 3 °C ≤ 5 mm 28 days, -1.5V, 80 °C ± 3 °C ≤ 10 mm	1-4 mm 1-3 mm 5-7 mm	1-4 mm 1-3 mm 5-7 mm
Flexibility @ - 30°C	IGS-M-TP - 026	No cracking @ 2 ppd	No cracking @ 3 ° ppd	No cracking @ 3.6 ° ppd
28 d hot-water adhesion 80 °C ± 3 °C	IGS-M-TP - 026	< 10 % of the test area blistering or disbonding no failure of adhesion pull off min 7 N/mm2 (> 50 % surface area cohesive)	No Delamination	No Delamination
Taber Abrasion Resistance	IGS-M-TP - 026	Maximum %25 total coating thickness	Pass	< 50 % total coating thickness

**Note: all tests performed on Dual layer system (Peka-Pro Pr (450±50µm) + Peka-Pro DL-AR or Peka-Pro DL-UF (450±50µm))**



## *Peka-Pro Pr*

*(primer for 3 layers and dual layer system)*

Triple-layered polyolefin system is the most famous protective coating for oil, gas and water pipelines all over the world.

*The steps to apply include:*

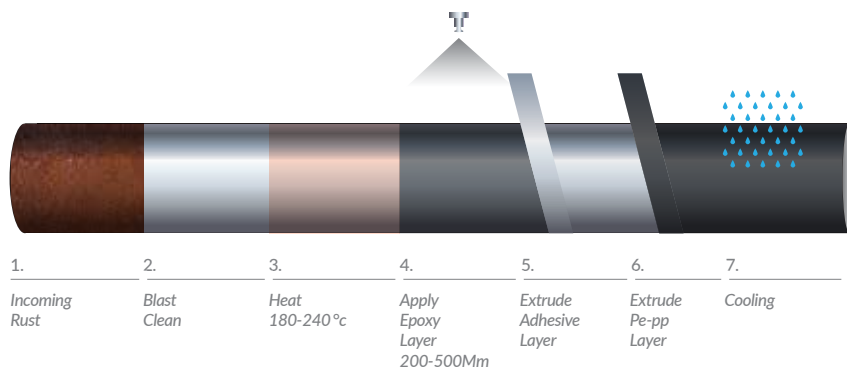
1. The surface pretreatment of the steel pipeline with shot blast operation
2. Application of Peka-Pro Pr on steel surface as a primer
3. Application of the copolymer adhesive layer
4. Application of polyethylene top layer in strip form with the extruder.

This system has excellent cathodic disbondment resistance, high resistance to chemical attack and outstanding mechanical performance. Peka-Pro Pr has wide application range and is also used as a primer for dual layer system.

Peka-Pro Pr meets IGS-C-TP010- and CSA Z245.21 and Aramco 09 - SAMSS - 089 standards.

#### Application Process:

(Picture, Thickness 200 - 500 $\mu$ m, Temperature 180 - 240 °C)



#### Technical features of Peka-Shield Pr as primer for three layers system

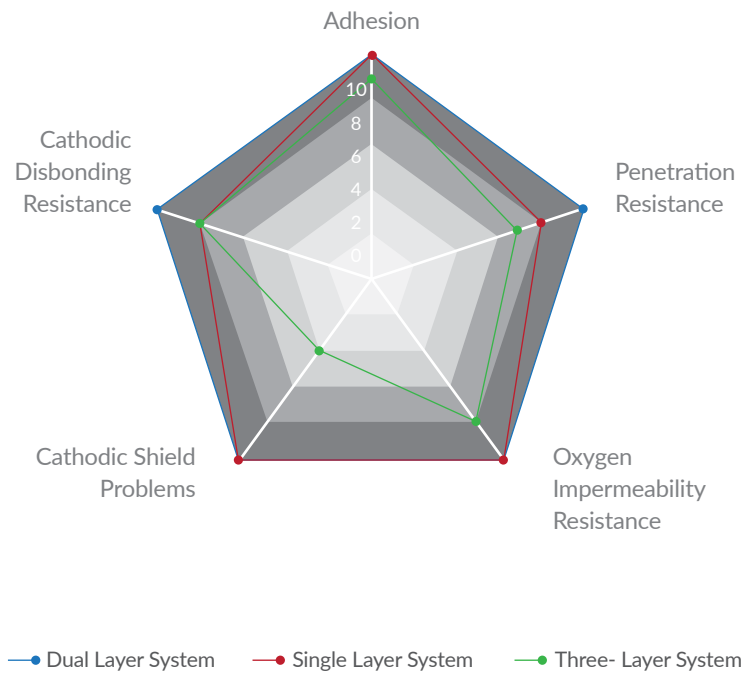
PROPERTY	SPECIFICATION	ACCEPTANCE CRITERIA	RESULTS
Color	----	----	Grey
Gel time at 205 °C	IGS - C - TP - 010	----	20-40 sec
Cathodic Disbondment	IGS - C - TP - 010	28 days, -3.5V, 65°C $\pm$ 3 °C $\leq$ 15 mm	5-9 mm
Flexibility @ - 30°C	IGS - C - TP - 010	No cracking @ 3° ppd	Pass
28 d hot-water adhesion 75 °C $\pm$ 3 °C	IGS - C - TP - 010	Rating of 1 to 2	No Delamination



*Properties of Different  
FBE System at a Glance*

10= Excellent 1= Very Poor

Customers choose the suitable FBE system according to their need.  
 The graph below compares the efficiency of FBE systems.



Dual Layer System



Single Layer System



Three - Layer System

# *Peka-Pro Re*

*(Rebar Coating)*

Steel rebar in concrete structures is usually protected by a passive film formed due to the alkaline environment of fresh concrete. However, this protective film can be degraded by the ingress of chloride or carbonation of the concrete cover layer. Once damaged, corrosion initiates in the presence of oxygen and moisture.







The volume of the corroded parts is usually two to six times greater than the volume of the original steel it consumes, resulting in tensile stress in the surrounding concrete. When the stress exceeds the tensile strength limit of concrete, cracking/spalling occurs in the concrete. Meanwhile, corrosion reduces the steel-concrete bond strength and the cross-sectional area of steel rebar. Therefore, steel corrosion is one of the main causes of premature deterioration in concrete structures.

Many techniques have been developed to protect steel rebar from corrosion in concrete structures, such as the addition of corrosion inhibitors or high-performance admixtures, use of protective coatings or corrosion resistant bars. Among these methods, the use of protective coatings is one of the most efficient methods because it can establish a physical and chemical barrier between the steel rebar and the corrosive environment.

Fusion-Bonded Epoxy (FBE) coating was identified as an effective method of corrosion protection in the early 1970s when, in North America in the late 1960s, premature deterioration of highway bridge decks was discovered as a result of corrosion of the reinforced steel.

Peka-Pro Re has been used along with other systems or on its own to protect rebar, dowel bar/dowel bar baskets, welded wire fabric/wire mesh, mechanical splicing, and spirals. Peka-Pro Re is formulated to help provide superior flexibility for shop or field fabrication that exceeds current AASHTO and ASTM bend requirements. Peka-Pro Re is resistant to corrosive agents such as de-icing salts, airborne salt spray, seawater, harsh chemicals, acid rain, and carbonation, contaminated aggregate and concrete additives.

*Peka-Pro Re meets ASTM A 775 / A 775M Standard.*

## *Peka-Pro IPC*

*(Internal Pipe Coating for Potable Water)*

Peka-Pro IPC has been used for potable water pipelines. For any pipeline internal lining application, the coating must withstand the constant flow of liquid or solid particles. This pure epoxy coating was designed for corrosion protection of water transporting pipelines. PEKA CHEMIE has got approval certificates that conform to TZW( Certificate number: MO 16/121) and Bodycote international Regulations for Potable Water Service. Peka-Pro IPC also meets the requirements of AWWA standard C213, and BS 6920 listed under WRAS (Cold & Hot water use up to 85 °C).

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