

October 20, 2007

Executive Director Jaime Quijandría  
Inter-American Development Bank  
1300 New York Avenue, NW  
Washington, DC 20577

**Subject: IDB Auditor Exponent, Inc. Identification of Design Deficiencies in Construction of Camisea I Pipelines and Need for Monitoring That Is Independent of IDB**

Dear Executive Director Quijandría:

The auditor contracted by the Inter-American Development Bank (IDB) to analyze the Camisea I pipelines, Exponent Inc., identified a number of deficiencies in the design and construction of these pipelines in its June 2007 report. The Camisea I project includes two pipelines, a natural gas pipeline and a natural gas liquids (liquids) pipeline, and became operational in August 2004. Six known ruptures of the liquids pipeline have occurred since December 2004, with the most recent rupture occurring in April 2007. However, IDB summarized the results of the Exponent technical audit as having uncovered no significant deficiencies in the June 2007 Camisea Project Environmental and Social Impact Report Performance Summary, stating:

*“At this stage of the project’s operational phase, TGP and Pluspetrol have complied with the environmental conditions established, with the exception of some requirements that are being presently addressed via corrective actions. These issues are relatively minor, taking into consideration the entire project, and do not represent significant potential impacts. IDB will continue with its supervision of the project, including the use of external specialized consultants (Matrix Solutions for environmental and social; Exponent for pipeline integrity, and Stone and Webster for technical monitoring).”*

E-Tech is thoroughly familiar with the June 2007 Exponent audit report. A number of serious pipeline deficiencies are identified in the body of the report, though the description of these deficiencies is framed in a manner that has the effect of minimizing their significance. These deficiencies are:

- 1. The lack of adequate geotechnical and erosion control along route during the construction phase represents an ongoing risk to the integrity of the pipelines.**
- 2. The thin pipe wall of the liquids pipeline makes this pipe susceptible to damage/ rupture caused by soil movement.**
- 3. There is an accelerated rate of corrosion in the liquids pipeline in the jungle sector.**
- 4. Failure to perform site-specific analysis based on actual streambed conditions at each stream and river crossing has increased the danger of exposed pipe and impact ruptures.**
- 5. The claim by TGP that circumferential welds are in perfect condition as a result of internal inspection is false.**

There is also one major omission in the Exponent report that has been a central point of controversy regarding the selection of the mountaintop route for the pipelines. Exponent limits its analysis of the route chosen for the pipelines to a statement that selection of the mountaintop route was appropriate considering the difficult terrain. The issue is not the selection of a mountaintop route. The issue is:

**6. The lack of detailed assessments of geotechnical conditions along the proposed route in the jungle sector prior to opening right-of-way and beginning construction unnecessarily created geotechnical risk (soil movement, landslides).**

Table 1 summarizes in more detail the: 1) deficiencies in the Camisea I pipelines identified by Exponent, and 2) the known deficiency that was not addressed by Exponent of no prior detailed geotechnical assessments of the chosen route before the right-of-way was opened and pipeline construction begun.

The loan approved by the IDB for Camisea I in September 2003 required that an independent environmental and social monitoring audit take place when pipeline operation was initiated in August 2004. This process did not begin until the fifth rupture in March 2006 focused intense scrutiny on the IDB and the Peruvian government and their respective roles in providing oversight of pipeline construction and operation. The June 2003 Camisea Project Environment and Social Impact Report is explicit on the central role of independent audits for verifying compliance with loan conditions (Recommendation 8.15):

*“As a condition for all disbursements (including the first) for the Downstream Component, the Downstream Component must be in compliance, to satisfaction of the IDB, with the environmental and social provisions in the Loan Agreement and this compliance must be certified by the external independent environmental and social consultant.”*

A core issue in the audit process is the definition of “independent.” IDB insists that consultants that it selects and that report directly to the IDB are independent. Yet the identification of a serious deficiency by the contractor could be construed as an implicit indictment of a failure of IDB oversight at some earlier phase in the project. A central concern of E-Tech is that consultants under the direct control of the IDB will mold their observations to conform to the expectations of the client. The upbeat executive summary in the Exponent report, that places even very serious pipeline integrity issues such as rapid deterioration of the liquids pipeline in the jungle sector in a positive framework, is an example of this phenomenon.<sup>1</sup>

It is E-Tech’s position that: 1) consultants directly hired by the IDB and whose work is directly managed by the IDB are not independent, 2) the Camisea I loan condition that explicitly requires ongoing independent environmental/social monitoring of the project must be met before the IDB Board of Directors considers approving a loan for Camisea II, and 3) the scope of the Camisea I independent monitoring program should be expanded to include pipeline operations and maintenance given the poor track record of the liquids pipeline to date. The entity conducting the auditing should not be under the direct supervision and control of the IDB. Such a contractual relationship creates the perception that the contractor is not independent and that the contractor is potentially subject to pressure intended to affect the scope and results of the audit.

Please feel free to contact me at (619) 295-2072 if you have any questions about the deficiencies identified in the June 2007 Exponent audit report that are summarized in this letter or the need for ongoing independent monitoring of the Camisea I project.



Regards,






Bill Powers, P.E.  
E-Tech International

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<sup>1</sup> Exponent states for example that a point in this section of pipeline has lost 49% of its wall thickness in two years of operation (presumably due to corrosion), but it has not yet failed and does not require immediate replacement. However, the specification cited by Exponent states that any pipe that has lost 50% of its wall thickness must be replaced within 6 months.

Observation by Exponent	Issue and Supporting Information	Photographs
<p>To minimize environmental impact, the constructor decided to preferentially build the pipeline along mountain ridges. The right-of-way (ROW) was cleared and cut, and the work was inspected by outside consultants.</p> <p>The ground conditions encountered during installation of the pipe were reportedly assessed by geotechnical engineers and some mitigation measures were constructed at that time.</p>	<p><b>The lack of detailed assessments of geotechnical conditions along proposed route in jungle sector prior to opening right-of-way and beginning construction unnecessarily created geotechnical risk (soil movement, landslides).</b></p> <p>OSINERG president Alfredo Dammert testimony:* <i>“The concession holder (TGP) is responsible for establishing the pipeline route.”</i></p> <p>TGP representative Mario Dell’Acqua testimony:* <i>“We were the first to enter this jungle. All other studies were studies via helicopter overflights. But you can see that despite this we opened the right-of-way, excavated the trench, and set the pipeline in place in our first attempt”.</i></p> <p>TGP geotechnical consultant Golder Associates, testimony of Sigfried Arce Helberg:* <i>“Golder spent 36 days in the field in October and November 2001 conducting a rushed preliminary route survey across nearly 200 kilometers of largely uncharted jungle terrain. Critical zones that required route changes were identified and flagged for further study.”</i></p> <p>(*) Transcript of testimony given to Peruvian congressional committee investigating Camisea pipeline ruptures, June 2007.</p>	
<p>Exponent observed over 50 sites, some on both occasions, during our field inspections in June and September 2006. Based on our review, observations, and engineering experience, we concluded that geotechnical and geologic conditions initially posed a substantial risk to the pipeline.</p>	<p><b>The lack of adequate geotechnical and erosion control along route during the construction phase represents an ongoing risk to the integrity of the pipelines.</b></p> <p>IDB consultant URS documented severe erosion control problems in its monthly field reports in 2002-2003, stating TGP was consistently violating its own erosion control technical specifications and appeared exclusively concerned with <i>“advancing the laying of pipe.”</i></p> <p>USAID recommended in a July 2003 memorandum to the U.S. Treasury against the U.S. Government voting for the \$75 million IDB loan to TGP in part because of erosion control problems observed in the pipeline right-of-way.</p>	
<p>Presently no (intelligent pig) pipeline inspection company is readily able to provide a commercially available inspection tool to detect potential circumferential cracks.</p>	<p><b>Claim by TGP that circumferential welds are in perfect condition as a result of internal inspection is false.</b></p> <p>Exponent states that the intelligent pipe inspection can not detect cracks in circumferential welds. There are circumferential welds every 12 meters on the 560 km. liquids pipeline.</p>	<p>Photo: by URS, IDB consultant, km. 50, 2004.</p> <p>Ricardo Ferreira, TGP press conference hosted by MEM, December 14, 2006: <i>“Liquids pipeline welds are in perfect condition as confirmed by the summer 2006 intelligent pig inspection.”</i></p> <p>See: December 15, 2007 MEM press release on the TGP briefing on pipeline status.</p>

Observation by Exponent	Issue and Supporting Information	Photographs
<p>Our design review revealed that the pipeline designers assumed that external soil loading would be entirely mitigated by geotechnical mitigation measures implemented during construction. Load capacity estimates for the liquids pipeline show that, while sufficient for internal pressures, it is susceptible to this external failure mode, which is consistent with four of the first five spill incidents. Natural gas pipeline is more robust and has 6x the capacity to resist external loads.</p>	<p><b>The thin pipe wall of the liquids pipeline makes this pipe susceptible to damage/ rupture caused by soil movement.</b></p> <p>Photo: cross-section of 5.56 mm (0.219 inch) liquids pipeline at point of 1<sup>st</sup> rupture at km. 8.8 (photo from Exponent report).</p>	
<p>There is accelerated corrosion in certain sections of the liquids pipeline, especially in the first 50 km. This corrosion weakens the pipe. The 2006 intelligent pig inspection revealed a point in the jungle sector that had lost 49% of its nominal wall thickness to corrosion. Approximately 20% of the corroded sites detected during the internal inspection had lost between 10 and 25% of nominal wall thickness, the remaining ~80% less than 10%.</p>	<p><b>There is an accelerated rate of corrosion in the liquids pipeline in the jungle sector.</b></p> <p>The TGP technical specification used on the project required the replacement of any pipe sections that had lost more than 10% of their nominal (design) thickness at the time of installation.</p> <p>The international standard referenced by Exponent, DOT 49 CFR 195.542, stipulates that repairs must be carried-out within six months if pipe has lost 50 percent of design wall thickness.</p> <p>Polyguard, the U.S. manufacturer of pipe joint seals, wrote a Sept. 17, 2007 letter to the MEM Minister Valdivia clarifying that Polyguard seals were not used in the jungle sector on the liquids pipeline, and questioning whether the cathodic protection on the pipeline was serving the intended purpose. The letter references the Exponent audit. The September 17, 2007 Polyguard letter is attached.</p> <p>Photo: liquids pipeline joint seal with poor adherence - jungle sector.</p>	
<p>TGP partially followed an international standard (FHWA HEC-18) in determined the depth of burial of the pipe under streambeds.</p>	<p><b>Failure to perform site-specific analysis based on actual conditions at each stream and river crossing has increased danger of exposed pipe and impact ruptures.</b></p> <p>TGP relied on a computer model to determine depth of burial for the pipelines. The lack of site-specific analysis to corroborate that the calculated burial depth was sufficient at each crossing creates the potential for more impact ruptures of pipe placed under streambeds. There are 62 stream and river crossings along the route.</p> <p>Photo: picture of 4<sup>th</sup> rupture, caused by rock impact in steambed, occurred Nov. 24, 2005 (photo from Exponent report).</p>	

# POLYGUARD PRODUCTS, INC.

SELF ADHESIVE PROTECTIVE COATINGS FOR ENGINEERING AND CONSTRUCTION

September 17, 2007

Minister Juan Valdivia Romero  
Peruvian Ministry of Energy & Mines  
Avenida Las Artes Sur 260, San Borja  
Lima, Peru

**Subject: Joints Seals Used in Jungle Sector of Camisea Liquids Pipeline were Not  
Manufactured or Licensed for Manufacture by Polyguard**

Dear Minister Valdivia:

Polyguard USA has been in the protective coating business, serving operational crude oil, gas and liquid pipeline companies since 1954. Our company, from its beginning to this day, specializes in coatings that are applied to metal pipe for use, buried in the ground. During that time, Polyguard, USA has developed or patented several coatings that have achieved wide industry acceptance in the USA. Through these years, we can count most every major energy pipeline company as customers. This in itself addresses acceptable performance.

Up to several years ago, Polyguard USA was basically a USA domestic endeavored company. However, we are now expanding our merchandizing efforts, including presence in the South American market area. As a result of this, a concern to us has occurred based upon the reported use of "Polyguard" joint seals (shrink sleeves) on the Camisea liquids pipeline. This reported use is unfairly creating a negative reputation for the Polyguard USA name and for the products it manufactures.

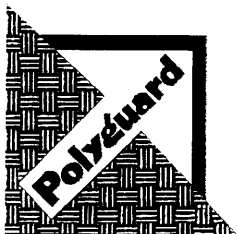
In addition to the negative affect the above report has upon Polyguard USA., it may similarly affect our Peruvian distributor in the legitimate pursuits they make to market our products.

Polyguard USA, at no time, neither has manufactured, licensed nor sold shrink sleeves to any company, anywhere. Specifically, this includes those sleeves that were previously used in the jungle sector of the Camisea Liquids Pipeline. It is Polyguard USA information that Fameim's originally licensed shrink sleeve technology came from a European manufacturer. To our knowledge, that licensing agreement no longer exists. Fameim however, continued to sell shrink sleeves, using the Polyguard brand name.

In addressing the issue involved here, it is important that we show that the problem sleeves used on the Camisea pipeline could not possibly have any relation to Polyguard USA. This being for no other reason than Polyguard USA has never manufactured and has never attempted to sell shrink sleeves. The reason for this is explained later.

The shrink sleeves used in the jungle sector on the Camisea liquids pipeline is not a Polyguard USA product, despite the trade name "Polyguard BWS" used by their manufacturer, Fameim of Buenos Aires, Argentina.

What follows is a review of the relational history of Polyguard USA and Fameim Polyguard of Argentina. In the early 1980's Polyguard USA was contacted by Fameim, who inquired about the possibility of licensing the Polyguard trademark and technology. Then, the management of Polyguard USA signed a license, and assisted Fameim in setting up production facilities in Argentina. That relationship between Polyguard USA and Fameim was close through 1986, when Polyguard USA changed ownership and management. The relationship between Polyguard USA and Fameim continued on a limited basis until the 1990's.



ENNIS, TEXAS 75120-0755  
PH: 972-875-841 FAX: 972-875-9425  
E-Mail: [Polyguard@polyguardproducts.com](mailto:Polyguard@polyguardproducts.com)  
Web Site: [www.polyguardproducts.com](http://www.polyguardproducts.com)



During the 1990's the relationship began to deteriorate as Polyguard USA noted Fameim had modified the design of the Polyguard USA RD-6 coating system, which was developed primarily for use as a girth weld coating (joint seals) and as a coating used in the rehabilitation of older pipelines.

It should be pointed out here that this Polyguard USA RD-6 coating has experienced substantial increases in use and acceptance in the United States each year for the last 20 years. So, the design modification made to Polyguard USA RD-6 by Fameim resulted in a different product possessing neither the same component structure nor the same proven performance property. In addition to the design change of our coating, Fameim stopped paying royalties owed.

Fameim has continued to represent itself as a legitimate Polyguard licensee. Fameim is not a legitimate Polyguard licensee.

The audit of the Camisea pipelines conducted by Exponent for the Inter-American Development Bank, published in June 2007 (<http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=999499>), states (p. 77): "it also appears that there is a relatively elevated frequency of metal loss occurrences within the first 50 km of the NGL pipeline." It is of the utmost importance to Polyguard USA that all parties active in the Peruvian petroleum industry clearly understand that the product sold by Fameim and used on the Camisea liquids pipeline has no relation to Polyguard USA or any Polyguard USA trademark product.

We will be grateful for your assistance in clarifying to the energy industries in Peru, that the joint seals (shrink sleeves) used in the jungle sector of the Camisea liquids pipeline are not Polyguard USA products.

As stated, the above factual information relates to clarification as to what and whose product was used on a sector of your Camisea pipeline. To supplement this information, we would like also to explain another reason why the product used in that sector of the pipeline could not have been of Polyguard USA origin.

It is the belief of Polyguard USA, that shrink sleeves, along with other solid film backed corrosion coatings, should not be used on pipelines that also utilize cathodic protection (CP). To explain this, there is much information available to you for examination that shows this belief to be correct. However, to minimize the space and time here, we attach a copy of a recent advertisement shown in the Oil and Gas Journal.

We would be glad to provide the Peruvian Ministry of Energy and Mines a list of pipeline companies that have used the Polyguard USA RD-6 coating system so the Ministry can independently corroborate that properly applied Polyguard USA RD-6 coating can provide long term protection to steel pipelines, buried in the ground.

Sincerely,



Chic Hughes  
Vice-President

- cc: Ing. Gustavo Navarro, Director General, Hydrocarbons, Peruvian Ministry of Energy & Mines, Lima Peru
- cc: President Alfredo Dammert, OSINERGMIN, Lima, Peru
- cc: Luis Alberto Moreno, President, Inter-American Development Bank, Washington, DC
- cc: Robert Montgomery, Private Natural Resources Specialist, Inter-American Development Bank, Washington, DC
- cc: Lutz Wittenberg, Managing Director, Germanischer Lloyd Industrial Services GmbH, Hamburg, Federal Republic of Germany
- cc: Dr.-Ing Hans Berg, Managing Director, Germanischer Lloyd Industrial Services GmbH, Hamburg, Federal Republic of Germany
- cc: Mr. Rainer Schoendube, Executive Director, Germanischer Lloyd AG, Hamburg, Germany
- cc: Dr. Hermann J. Klein, Executive Director, Germanischer Lloyd AG, Hamburg, Germany

# Is cathodic protection worthless?

## What kind of question is this?

Most in the pipeline industry agree that cathodic protection (CP) is the smart way to provide backup corrosion protection on underground pipelines.

But consider: If you use solid film backed corrosion coatings, you may be wasting money by adding CP to the pipeline.

There is a common sense reason for this statement. CP systems protect pipelines by delivering electrical current to the steel surface. Solid film back corrosion coatings have the property of *resistivity*, which means they *block* electrical current. This blocking effect is called *cathodic shielding*.

The phenomenon of *cathodic shielding*, or blocking of protective CP current, has been the subject of dozens of technical papers since the mid 1980's. You can review a cross section of these papers on Polyguard's website. You can also

view a 10 minute explanation of the cathodic shielding process.

Worldwide, we estimate that over half of pipelines are being coated with solid film back coatings, such as shrink sleeves, tapes, and 2 or 3 layer systems. Most of these lines have CP systems. These are the operators who may be wasting their money on CP. Moreover, many install shielding coatings on girth welds, the most vulnerable area for corrosion.

Two corrosion coatings are proven to be non-shielding, and allow passage of protective CP currents. One of these coatings is FBE. The other is Polyguard RD-6.

NACE Standard RP0169-2002 states: "*Materials...that create electrical shielding should not be used on the pipeline*"<sup>1</sup>.

49 CFR §192.461 states: "*External protective coating ...must ...have properties compatible with any supplemental cathodic protection.*"<sup>2</sup>

If you are concerned that your organization is behind this curve, we recommend:

1. Visit [polyguardproducts.com/tailsafecoating.htm](http://polyguardproducts.com/tailsafecoating.htm) and review the large body of information about shielding problems.
2. Talk to operators who have used Polyguard's RD-6 system. (*There are many*) Ask them if they know of any serious corrosion or SCC ever found under RD-6. (*We don't, even after 19 years and thousands of installations*).
3. Have someone in your organization attend the NACE course "*Coatings in Conjunction with Cathodic Protection*".

1. NACE Standard RP0169-2002 "Control of External Corrosion on Underground or Submerged Metallic Piping Systems".  
 2. 49 CFR Ch.1 (§192.461 see also §195.559)

