

Innovation Solutions for Industry – Chemical Process Plant



The first use of POLIDAN TUX 100 – based ChemPEX piping system, for an industrial application. A safe, easy to install and highly economical solution, for the transportation of chemicals at high temperatures and pressures.

Introduction

SGIM (Societa Generali Italiana Magnesia) is Company of the SOLVAY group, manufacturing calcium and magnesium based compounds. The Company manufactures CaCO_3 (calcium carbonate) through a precipitation reaction that takes place with CO_2 and water.

The Original Pipes

Conduits manufactured from Carbon steel and comprised of 2 vertical segments (1 ascending and 1 descending) and a horizontal one, connected by elbows and attached to the reactor and an external manifold. Each conduit is approximately 4.5M long, weighing about 150kg.

Product Conveyed

Aqueous vapour gas and CO_2 carrying highly fouling CaCO_3 powders. The service conditions Operating temperature 65 – 70°C, pressure 0.3 bar.

The Previous Situation

The persistent fouling action of the gas, continually reduced the 12 conduits efficiency and required de-scaling operations every 25-30 days. The total weight of each exhaust conduit, with the addition of about 20-25kg of deposits, made it necessary for a 5-man team who, (with a hoist and supporting poles), removed the conduit cleaned it and put it back in place.

The whole operation took about 2 hours for each reactor. This had an adverse effect on the maintenance costs and in addition, the amount of down-time made it very difficult for all 12 reactors to function simultaneously at any given time.

The PEX Alternative

SGIM decided to test alternative materials for one of its production units. In July 1999, Nupi spa (Industrial Division) initiated the study. The piping system immediately chosen was TUX 100-based ChemPEX, since the mechanical, physical and chemical features of this material are very well

suitable for the particular application. Furthermore, since the product has a significant water cut, the ChemPEX piping system could be cross-linked in situ, thus ensuring right from the start of the operation that the full benefits of this high performance engineering thermoplastic material were being utilised. Nupi spa, initially developed and manufactured a prototype of the vertical segment of the conduit which was immediately installed. The project included the design and manufacture of a 90° fabricated bend to connect the prototype to the horizontal steel segment. The prototype was to assess the application related installation and removal procedures.



The Trial

The installation of the Nupi spa's prototype took 20 minutes and involved two of the five

men who had previously disconnected the vertical steel element. The prototype weighed about 20kg and required no hoist or any tool except a wrench to tighten the flange bolts onto the reactor and steel pipes. SGIM's technical personnel removed and re-installed the prototype conduit after 30, 60 and 160 days. In the course of the assessment operations, no deposits or scaling were found on the pipe's internal walls and each removal/installation was performed in a matter of minutes, with a truly negligible down time for the line.

...and finally

In March 2000 SGIM decided to purchase the ChemPEX system, using POLIDAN TUX 100, cross-linkable Sioplas type HDPE compound. The internal surfaces of the fabricated bends were specially treated to make them perfectly smooth, in order not to impeded the pipes mirror-like surface. In fact it's the smoothness that accounts for the absence of deposits, since the vapour droplets containing CaCO_3 cannot adhere to the walls, as they do on the much rougher steel surfaces. The values of superficial roughness for POLIDAN TUX 100 and carbon steel are respectively, 4×10^{-6} and 1×10^{-4} (m).

The Benefits for the Customer

The intrinsic design of POLIDAN TUX 100 ensures that the conduits will maintain their high performance profile with no deterioration caused by chemical aggression and temperature or by corrosion and scaling which (besides impairing the operation of the line) could foster long term bacterial aggression.

From a maintenance point of view, it is interesting to note that the frequency of each operation is now reduced to just 90 days and requires less time. As well as reducing costs, there are improved personal safety aspects using this new material, since each of the POLIDAN TUX 100 conduits has an overall weight equalling 1/3 of its non scaled steel equivalent, which cuts the risks involved in handling vertical and aerial pipes to almost zero. Furthermore, exposure to vapours containing CO_2 is limited to a few minutes and to two workers per reactor.

Application-related and technical literature is available on the internet at www.padanplast.com and www.chempex.net

POLIDAN TUX 100 system's expected operating lifetime is 10 years as required by SGIM's design specifications. Nupi ID manufactured the ChemPEX conduits at its Imola (Bologna) plant and the fabricated bends at its Busto Arsizio (Varese) plant.

Solvay Padanplast manufacture POLIDAN TUX 100 compound in its Roccabianca (Parma) plant

Innovative Solutions in Industry using PEX



