

INTRODUCTION

In power industry, changes in operating requirements for fossil boiler units have put an additional demand for minimizing corrosion on these units under these new conditions. There are large changes in metal temperatures with thermal contraction during shutdown, followed by expansion during startup along with a large influx of dissolved oxygen. The increased corrosion causes a large transport of metal corrosion products to the boiler, leading to deposits and corrosion sites that can cause tube failures. Startup times are often increased along with decreased availability. As a result, more frequent chemical cleaning may be needed.

Apex has developed FilmPro™ Nexus BC-1452, a Film Forming Products (FFPs), to address the issues outlined above. This Apex FFPs product is a paradigm shift to conventional chemistry which basically relies on water chemistry adjustments (i.e., phosphate, pH) to provide the necessary protection. Instead, Apex's FilmPro™ Nexus BC-1452 focuses on surface protection rather than water chemistry adjustments. The Apex FFPs product forms an impermeable layer on metal surfaces, inhibiting the direct contact of water with the metal, and thus minimizing corrosion, protecting equipment, and maintaining reliable operations.

CUSTOMER BENEFITS

Reduced Corrosion Iron Transport: Apex FilmPro™ FFPs minimize the detachment and transport of iron oxides and yellow metal corrosion products during start-up.

Improved Heat Transfer Rates: Apex FilmPro™ FFPs improve heat transfer rates across steel tube surfaces, resulting in better overall system performance.

Extended Equipment Lifespan: Apex FilmPro™ FFPs protect critical equipment during shutdowns and lay-ups, avoiding corrosion and iron-related damages.

Greener and Safer Alternative: Apex FilmPro™ FFPs are non-toxic and do not require extensive personal protective equipment (PPE) during handling, making them a greener alternative to some conventional chemicals.



Frequently Asked Questions

The following are the answers to some frequently asked questions from our customers when evaluating Apex's FilmPro™ FFPs program.

1. HOW DOES SURFACE-ACTIVE CORROSION INHIBITORS WORK?

Apex's FilmPro™ Nexus BC-1452 is a non-amine film forming product (NFP). Surface-active corrosion inhibitors are organic molecules that have the capability to react and attach to the metal surface. Unlike a Film Forming Amine (FFA), the NFP compounds can use much smaller organic molecules without the hazards and operational complications that occur in high pressure units.

2. HOW CAN AN APEX FILMPRO™ PRODUCT HELP?

Apex's FilmPro™ Nexus BC-1452 attaches a monomolecular layer of a hydrophobic layer to the metal surface that protects the metal surface from further oxidation. Continuous feed protects the metal during normal operation and unplanned shutdown and startups. Even if the unit is drained, protection continues. During startup the film provides continuous protection if the fill water is treated to a pH > 9. Suspended iron is minimized, and startups are considerably cleaner.

3. WHERE SHOULD I FEED THE PRODUCT?

For maximum effect of the passivating film, it should be fed early in the condensate/feedwater system. Some have fed an NFP product directly to the condenser. If you have a polisher, you should feed it at the discharge of the polisher. The product is volatile above 1,000 psig and will provide protection throughout the steam/water cycle.

4. IS FILMPRO™ PRODUCT THERMALLY STABLE?

All organics, if heated to 1050°F for a long enough period, are subject to decomposition. Due to the velocity of flow in superheated piping the decomposition is quite limited. Since the molecule is smaller than FFAs, the decomposition products of any unattached film will be reduced and much smaller, such as: acetic acid, formic acid, and CO₂.

5. WILL THE PRODUCT INCREASE CACE ABOVE GUIDELINE LIMITS?

Apex's FilmPro™ Nexus BC-1452 is designed for minimal effect on CACE. If fed at the recommended feed, you will be able to stay within recommended parameters.

6. WILL THE PRODUCT HAVE A NEGATIVE EFFECT ON THE DISCHARGE OF MY POLISHER?

No, there have been EPRI studies that have shown no negative effects on polishers with concentrations less than 200 times the normal feed rate. Due to the reduced loading of iron oxide to the polisher, and resulting lower differential pressure, you should expect longer runs.

7. SHOULD I BE CONCERNED IF I DON'T SEE A VERY HYDROPHOBIC LAYER?

As you feed FilmPro™ Nexus BC-1452, a layer of protection is reacting with the heated metal surface. It does not cover the complete system immediately. There are levels of hydrophobicity, and it increases with the length of application. However, dramatic reductions in corrosive products are likely within days of the initial application depending on the size of the system.

8. WILL FILMPRO™ FOUL INSTRUMENTS & TRANSMITTERS?

The product reacts with the heated metal surfaces. There has been no evidence that NFPs will foul probes or sensors.

9. WHAT IS CLEANSING?

When the product is first applied you will see a slight increase in cation conductivity due to the penetration of the existing magnetite layer and releasing any existing anions capable of under-deposit corrosion.

10. DO YOU HAVE TO INSTALL ADDITIONAL FEED SYSTEMS TO FEED FILMPRO™?

If a passivating agent (like carbohydrazide) is being fed, you should replace the scavenger with FilmPro™ Nexus BC-1452. You will see a marked improvement in cleanliness of startups without having the concern of oxygen pitting. Many systems dilute their amine or ammonia in a day tank to avoid pump gassing issues. If you have an ammonia or amine day tank you can add the FilmPro™ Nexus BC-1452 product directly to the day tank with no adverse effects to the product.

11. HOW DO I CONTROL THE FEED OF THE PRODUCT?

Most plants control the feed of NFPs based on flow. If the pump is set up based on maximum flow rate it will increase the product concentration at reduced loads. However, overfeed is not an issue with these products up to double the recommended FilmPro™ Nexus BC-1452 feed rate of 1 ppm. If you have a pump with control functions, you can adjust the product based on feedwater flow. If you add the product to the ammonia day tank we will provide the calculation for your system to control feed based on pH.

12. HOW DO I MEASURE CONCENTRATION?

There are currently no accurate field measurements available for NFPs. There is on-line TOC available that can measure the on-line concentration, but most plants do drawdowns at the pump and compare the rate to the system flow rate.

13. THERE ARE OTHER FILMERS IN THE MARKET. WHAT MAKES FILMPRO™ DIFFERENT?

NFPs are difficult to blend at high concentrations. We have developed an innovative manufacturing process that has allowed us to achieve higher concentrations than normally available. As such, the use costs are lower, there is less freight, and FilmPro™ Nexus BC-1452 products provide better asset protection.

14. ARE THERE HEALTH, SAFETY & ENVIRONMENTAL CONCERNS?

Apex's FilmPro™ Nexus BC-1452 is considered both nontoxic and nonhazardous.