How to Save Time Locating and Measuring Interference Current from a Foreign Line

A pipeline or cable may carry an unwanted and sometimes unexpected current because of interference from a foreign line, subway, or other conductor in the vicinity of our line. Corrosion occurs where current leaves a line and enters the soil so we want to locate and measure the current and find its source. A DC Amp Clamp is a time saving tool for doing this, with improved accuracy.

How to Measure Interference Current

Figure 1 is an idealized example of interference. Currents enter our line from an anode ground bed for a foreign line. The interference current at one location on our line due to the foreign anodes is measured by noting the change in the DC Amp Clamp's reading as the connection to the foreign rectifier is interrupted.

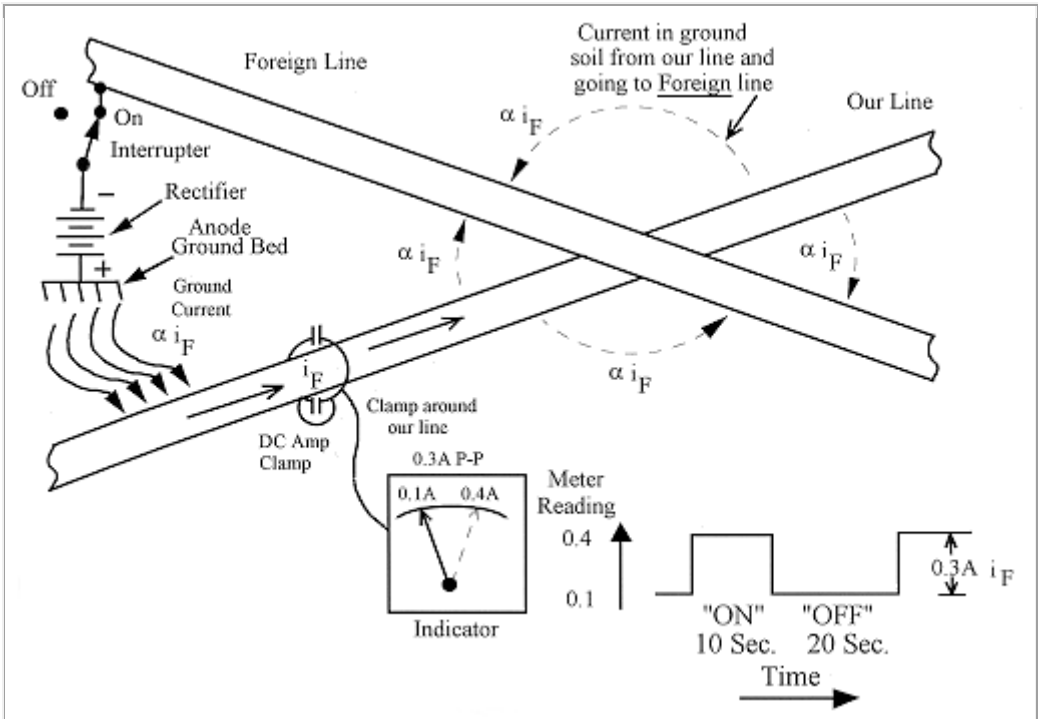

Figure 1

Illustrates a situation in which current αi_F is entering the soil from our line as a result of interference from a foreign line.

To measure the current at that location a DC Amp Clip is placed on our line. The interference current i_F is the 0.3 A difference between the "on" (+0.4 A) and "off" (+0.1 A) current readings when an interrupter is connected in series with the rectifier of the foreign line.

The indicator's meter reads +0.4 A during the 10 second interval when the foreign rectifier is connected by the interrupter. Then the interrupter opens the connection to the foreign line's rectifier for a 20 second interval. This causes the DC Amp Clamp's meter to read +0.1 A, which could be zero offset, current from our line's rectifier, or some other source.

The total interference current, i_F in our line at the particular location shown due to the foreign line is the Peak-to-Peak current change, i.e., the ON reading (+0.4 A) less the OFF reading (+0.1 A). Therefore, i_F = +0.3 A. This is known to be flowing in the direction shown (anode to pipe) because the double cabled section of the clamp is up, the bridle is to the left [2], and the ON reading is more positive than the OFF reading.

This says that the unwanted and perhaps unexpected current due to the foreign line entering our line to the left of the clamp and leaving our line to the right of the clamp is 0.3 A.

Of course, current leaving our line may be flowing into a resistance bond or other metallic conductor -- not the soil. If this current equals the maximum in our line there is no corrosion.

How to Locate a Source of Interference

The interference current can usually be located by the method shown in Figure 2 and an examination of the territory near our line and a nearby foreign line. In this example, the work is simplified by discovery of a new foreign rectifier and anode ground bed.

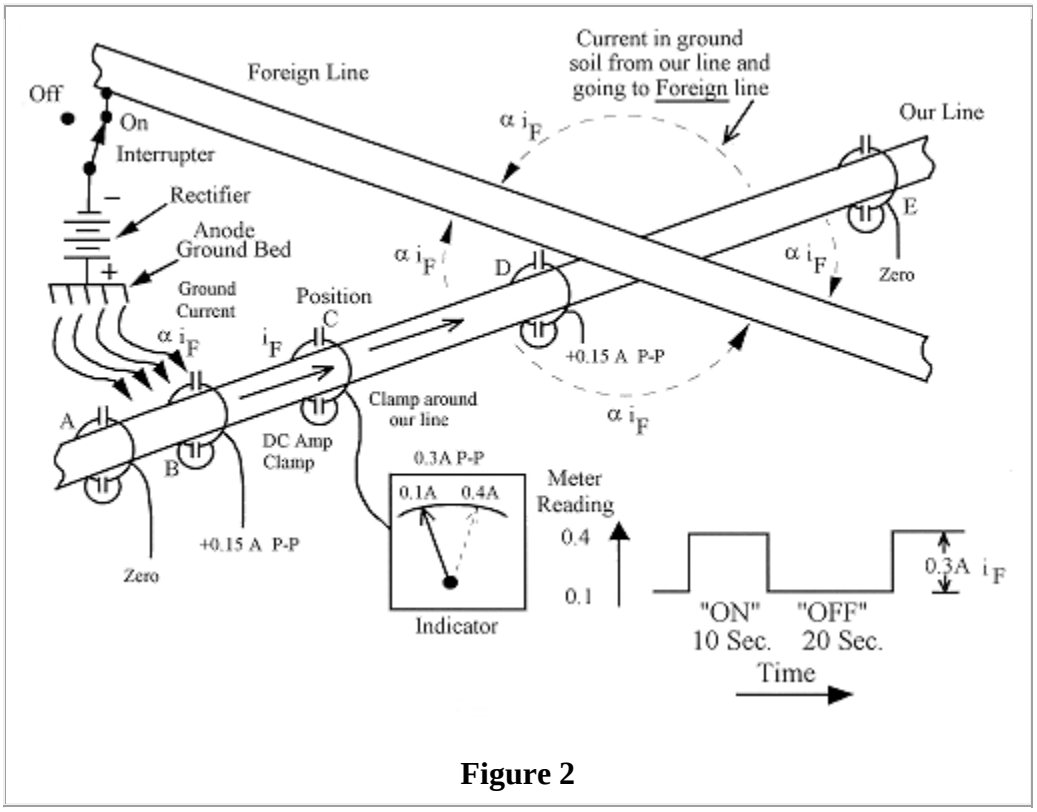

Figure 2

It can be established that the foreign line is indeed the source of interference current flowing in our line by measuring the current in our line at several locations on both sides of the new anode ground bed and the foreign line.

Measurement is simpler and more accurate if the foreign line current near our line is interrupted as shown in Figure 1 and 2. Most Corrosion Engineers are willing to help do this.

The procedure shown in Figure 1 measured the current due to the foreign line at position C on Figure 2. This was done by measuring the peak-to-peak change in the DC Amp Clip's meter reading as the foreign anode connection was interrupted.

The source of interference is located as shown in Figure 2. In this idealized example, the current due to the foreign line is measured at 5 positions on our line. To make it easier to find the direction of current flow, the clamp is always placed in the same orientation.

At position C the current i_F is a positive maximum of 0.3 Amp. because the DC Amp Clamp is on our line to the right of all anode injection earth currents αi_F; and to the left of all current drains αi_F to the foreign line. All interference current from the foreign line i_F is flowing in our line at position C.

To locate the foreign anode bed and line the clamp is moved to find positions B and D where the interference is half the maximum found at position C.

At position B and D the DC Amp Clamp sees i_F = +0.15A, i.e., the peak-to-peak difference between the ON and Off readings of the meter on the indicator is +0.15A, with the 10 sec ON reading more positive than the 20 sec OFF reading. This is because only half the interfering current is in the pipe at these positions.

The center of the foreign rectifier anode ground bed is opposite position B, where the interference is half and increasingly positive as the clamp moves toward the foreign line. The foreign line itself is opposite position D where the interference is half, and less positive as the clamp is moved away from the anode bed.

Positions A & E are outside the current loop illustrated in Figure 2, so in this idealized case the interference current is zero. The meter on the DC Amp Clamp will not change its reading as the interrupter turns the foreign anode current on and off.

However, in a real line, some anode current is expected to flow to the left at position A; so the real interference current will be negative at position A. Negative current is shown on the meter when the 10 second ON reading is more negative than the 20 second OFF reading. There should be a short sector of our line where the interference is zero -- to the right of A, and to the left of the earth near the anode.

Also, in a real line the interference will probably fan back to the foreign line for some distance beyond position E. Then the interference at position E will be small, and diminish slowly as the clamp is moved to the right of E.

A DC Amp Clamp suited for measuring current in 24 to 36 inch pipes is shown in Figure 3.

Figure 3

DC Amp Clamp suited for measuring direct current in 24 to 36 inch pipes.

In a real situation these locations may vary. The earth near the lines may not be of uniform conductivity. Holidays in the insulation coating on either line can distort the interference current path. Fences or a third line can alter the apparent position.

It is fortunate that foreign lines usually have visible markers, and new rectifiers and anode beds usually stand out on the landscape. A visual study of the area is recommended.

The interrupter method of Figure 1 is generally accurate and usually saves time -- provided that it is only necessary to measure the current due to the interrupted source. However, in a real pipe line there may be currents flowing due to several other sources.

The simplest way to measure the current due to these other sources is to use the interrupter on each, one at a time. If this is not feasible, the full floating zero procedure may be used to measure the total current from all sources.

Conclusion

DC Amp Clamps can be used to save time and improve accuracy when measuring and locating foreign line interference.