Durability Expectancy of NOCX HDPE pipes for project owners

General Requirements

Stay Cable Bridges nowadays are designed for up to 120 years service life. Our NOCX HDPE pipes, used as corrosion protection for inner strands which provide good cable design in different colors, along with a reduced drag coefficient to avoid heavy cable vibrations, need to comply with this design life.

Mechanical Requirements

The mechanical properties need to remain good enough to keep the pipes in position, shape and function. The same postulation is valid for the pipe connections.
The pipe material needs to resist to the climatic conditions of the area of use.
Due to extrapolated experiences and static calculations on HDPE pipes in applications as pressure pipelines, it can be assumed that 50% of initial mechanical properties need to remain to comply with the specified design life.
To keep the initial material properties as good as possible, standard pipe materials need to be modified to resist against pipe micro cracks and degradation primarily caused by uv-radiation and temperature.

Appearance Requirements

The appearance of the installed pipes on the bridge should remain unchanged for at least 50 years according our experience with stay cable system contractors and project owners.
In detailed cable view, acceptance criteria of non-visible color change during first 25 years can be assumed, followed by slightly symmetrical color fading during next 25 years.
Dismantling of material is not accepted.
To preserve the appearance as long as possible, standard pipe materials need to be optimized to resist against color fading caused primarily by uv-radiation and temperature.

Production requirements

The pipes need to be produced in a perfect way with certified quality plans to ensure that the raw material properties will remain in the final product. Raw material, production and product tests are required.

Mechanical Properties of NOCX HDPE Pipes

NOCX HPDE pipes are produced from first grade pressure raw materials and PESTEC optimized color and additive mixture developed for best performance on stay cable bridges.
During pipe surface inspection of uv-tested pipe sample, (corresponding to 10 years exposure), only very minor micro cracks up to 100my depth were found. This is approximately 7% of the external colored co-extrusion layer and approximately 1% of total wallthickness. On pipes tested in 9 years of real exposure, micro crack was even lower. It can be assumed that pollution on exposed pipe surfaces creates an extra uv-protection of pipes causing even better results compared to the the artigicial laboratory uv-test equipment conditions.
Following this very good surface results, the relevant mechanical test results for stay cable applications of the same samples showed remaining properties of approximately 95% for the first 10 years.
Extrapolation of those results let assume sufficient pipe properties for 120 years bridge design life.

Appearance Properties

UV-tests for up to 20.000 hours (corresponding to 20 years exposure) show excellent color stability results. For details please review PESTEC Technical Information TI 110-14.
Again a comparison of realtime exposed pipes with laboratory tested pipes shows better results caused by the “pollution protection layer” as described.
Extrapolation of the uv-test results let assume very good color stability of NOCX HDPE pipes for at least 50 years.

Production

NOCX HDPE pipes are manufactured in ISO 9002 certified production, using state of the art extrusion equipments and tools to ensure best pipe material features.
Our quality plan includes all necessary tests starting with raw material quality, several production tests up to final laboratory product property tests before delivery.
Production facility and quality plan comply with the requirements.

Warranty

PESTEC provides 10 years guarantee based on a liability insurance covering property damage and product liability of nearly all countries worldwide.
As we are convinced of superb NOCX HDPE pipe quality, PESTEC extends up to 20 years based on PESTEC potention covering new supply free of charge for NOCX pipes incl. components, if there is an evidence for material fault, production or color appearance change as defined above.

References

More than 100 bridge installations of NOCX HDPE pipes worldwide up to now

Conclusion

PESTEC NOCX HDPE pipes are designed for cable stay bridges and comply with the state of the art requirements. Test results show very good results to let assume the pipes remain in good conditions for the intended bridge design life.