Significant case histories of kettle failures: making sense of a complex phenomenon.
WHAT IS THE CAUSE OF A KETTLE FAILURE?
Is there a common factor to all extreme corrosion phenomena?
Some Basic Facts:

- Iron solubility level in a molten bath varies with temperature.

- Temperature is not homogeneous and certainly not constant in any galvanizing bath.

- Localized temperature changes are common and constant, creating local rising in Fe solubility.

- When solubility increases, iron is dissolved from kettle walls.
CASE 1: THE « BURNER LEAK »

Found at a location directly influenced by flame. Commonly associated with malfunctioning burners. Can be controlled with regular burners checks and furnace maintenance.
CASE 2: THE « FLOW LEAK »

Found at a location where heat is either stagnating or being increased by turbulence.
Commonly associated with corners or sharp angles.
Can be prevented by optimized design, is somehow inevitable.
CASE 3: THE « DROSS LEAK »

Found at a location where a continuous dross accumulation has been present. Commonly associated with lower regions of the kettle, but can be close to top with crust accumulations. Can be easily avoided with good drossing\cleaning practices.
CASE 4: THE « WEIRD LEAK »

Only to be found very close to kettle bottom, especially in old kettles. Usually not resulting in significant spill or leak, it is commonly believed to be caused by micro-cracks in the dross area.
APPENDIX: « MECHANICAL LEAKS »

Found at a location where the kettle is physically broken by either tension or unsuitable welding. Commonly associated with uncontrolled overheating, bad packing or wrong welding materials. Can be prevented by materials selection and careful planning on heating stages.
CONCLUSIONS

• LEAKS CAN APPEAR IN A WIDE RANGE OF DIFFERENT CONDITIONS AND LOCATIONS.

• MOST LEAKS ARE CONNECTED TO ONE CIRCUMSTANCE OR CAUSE: AN INCREASE IN LOCAL SOLUBILITY LEVEL OF IRON.

• MOST LEAKS ARE ASSOCIATED TO BAD HEAT MANAGEMENT AND DISTRIBUTION.

• THERE ARE PARTICULAR CATEGORIES OF LEAKS THAT ARE ASSOCIATED WITH MATERIAL DEFECTS OF PHYSICAL STRESS.
Cosmic Rays Only Thing Immortal

NEITHER stars nor worlds, sunlight or heavens, can science admit to be eternal. Only one thing known to science can be called immortal—the cosmic rays investigated, among others, by the famous California physicist, Dr. R. A. Millikan. These rays may even be relics of days before there existed any universe as we know it now.
THANK YOU!
ANY QUESTIONS??

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