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Guidance on Industry Standard for Refractory Dry-out

GIS 72-003

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GIS 72-003. This Guidance on Industry Standard (GIS) is based on parts of heritage documents from the merged BP companies as follows:

British Petroleum (Pre-1999)

RP 15-1-1 BP Oil Company - Internal Insulating and Refractory Linings

Amoco

A NM-REF-DRY-S Refractory Dry-out Specification

ARCO

Engineering STD 110-D97 ARCO Engineering Standard – Refractory Linings

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Introduction

This dry-out specification is intended for dry-out of shop installed refractory linings, or where components are lined in the field independent of process equipment. These dry-out specifications require modification when used in conjunction with start-up of equipment after maintenance turnarounds. During start-up of equipment, the heat source, venting, heat flux and mass of heated components is not controllable as that required in shop lined equipment. Therefore, consult with the refractory specialist for start-up procedures related to heating rates for drying refractory.

Heating rates for existing refractory linings should be 55°C (100°F) or less to optimize lining life. Exceeding this proposed rate does not immediately compromise a refractory lining; however, older linings that contain spalling and severe cracking may experience immediate changes or increased damage. Moderate heating rates help reduce stress through a refractory lining system during initial heating and preserve lining integrity. Rapid heating rates increase stress through the refractory and reduce the number of thermal cycles needed to cause damage to the lining.

Cooling rates have the same effect on refractory as heating rates; therefore, cooling at 55°C (100°F) per hour will optimize lining life. Cooling at abnormally high rates will create excessive stresses within the refractory lining that will lead to early failure because of cracking and spalling.



1. Scope

This GIS defines technical requirements for dry-out of refractory lining systems for equipment operating at or above 510°C (950°F).

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

BP

GIS°72-001	Guidance on Industry Standard for Procurement of Refractory (including Material Performance Requirements).
GIS 72-108	Guidance on Industry Standard for Miscellaneous Refractory Construction Details.

3. Terms and definitions

For the purposes of this GIS, the following terms and definitions apply:

Alumel

An aluminium nickel alloy used in the negative leg of Type K thermocouples (Alumel is a trade name of Hoskins Manufacturing Company).

Beaded Thermocouples

Thermocouples where the two dissimilar metals are welded together to form a beaded hot junction.

Burners

Gas fired equipment that furnishes heating requirements for a refractory dry-out.

Chromel

A chromium-nickel alloy which makes up the positive leg of Type K and Type E thermocouples (Chromel is a trade name of Hoskins Manufacturing Company).

Dry-out

The initial heating of a newly installed castable lining in which heating rates and hold times are controlled to safely remove retained water (mechanical and chemically bonded water) without explosively spalling and to form a well distributed network of shrinkage cracks in the lining.

Explosive Spalling

A sudden spalling which occurs as the result of a build-up of steam pressure caused by too-rapid heating of castable refractory on the first firing.

Heating Rate

The rate of temperature rise in a controlled dry-out measured at a location near the heat source.

