SHIM STOCK ANALYSIS 定碳片分析

by Thomas H. Lotze

Technical Data

分析在一个熔炉“真正”碳势只需利用此简单程序就可完成，结果可以用来调整计算碳势的值在气氛控制炉中。像测量碳传感器或者其它分析技巧就如红外线，露点分析等等。

Analysis of 'true' carbon potential in a furnace can be achieved by this simple procedure. The results can then be used to adjust the calculated value of carbon potential in the furnace atmosphere controller, as measured by carbon sensors or other analytical techniques such as infrared, dew point analysis, etc.

INTRODUCTION绪言

The purpose of this paper is to describe a recommended apparatus and technique for measuring true or actual carbon potential. Precautions and considerations are described for accommodating to any atmosphere control system.
此文的目地主要描述一个被推见为测量实际碳势的仪器和技巧。防范和考虑任何气氛控制系统

THE TECHNOLOGY 技术

The procedure consists of allowing a coupon of carbon steel shim stock of known carbon content to equilibrate with carbon in the furnace atmosphere, and then measuring the resultant carbon content. This can be done either by measuring the weight increase, or by chemically analyzing the coupon for carbon content. Historically, there have been a variety of techniques by which equilibration of shim stock in the furnace atmosphere has been conducted. In some heat treat facilities, the shim stock is attached to the workbasket and follows the work through the process, including quenching. Unfortunately, this can result in a low measured carbon due to decarb in the vestibule prior to quenching. In other instances, the routine described in the ASM Metals Handbook is followed loosely without due consideration for some of the recommendations. This paper will describe a preferred routine that adheres to some fundamental principles, and a simple, inexpensive apparatus that allows convenient determination of the true carbon potential.
程序组成允许一个碳钢溥片的碳含量与熔炉中的气氛碳含量相平衡，然后测量碳含量，也可由其测量重量增加完成，或者由化学分析碳含量，在历史的观点上说，有多种方法和技巧由垫片平衡在熔炉气氛中已被引入。在一些热处理工具中，垫片被附中工具篮中和随着工作程序，包括淬火。不幸的是，这导致部份碳由于decarb在前庭提前淬火。在其它安案例中，在ASM金属手册中一般被描述为松懈并无正当考虑的介绍。本文将描述首选程序并附属一些基本原理，而且简单，便宜的仪器允许方便检测真正碳势。

SAMPLE PREPARATION样品制备

1. Cut a coupon of AISI 1010 (0.10 %C), certified shim stock to 1 3/8" x 4".
   剪下AISIcoupon1010（0.10 %C)，确认垫片至1 3/8" x 4".
2. Clean the coupon thoroughly with acetone and a paper towel, rubbing to remove loose deposits.

用丙铜和毛巾彻底擦净小溥片，擦亮并移出脏物

3. With rubber gloves, weigh the coupon in an analytical balance to the nearest 0.1 mg.
套上像胶手套，在天平称上称出小溥片的重量接近于0.1mg
4. Roll the coupon length wise into a complete cylinder.

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SHIM STOCK ANALYSIS

Technical Data

THE APPARATUS

Figure 1 shows the installation of the recommended apparatus in a typical furnace wall. The assembly should be placed at a height on the furnace wall, which allows the shim to be positioned a few inches above the workbasket, in order to provide unimpeded exposure to the atmosphere. To install, drill a 1" diameter hole through, (and perpendicular to) the furnace wall, and through the insulation. Weld the 1" NPT x 3" nipple to the wall as shown. Thread the 1" ball valve onto the 3" nipple and thread the 6" nipple into the ball valve.
图1
显示被推荐的仪器设施在典型的熔炉墙壁中，集中点要设置在炉墙高处并允许垫片位于工具篮几英寸的上方。为了提供无阻碍展显在气氛中，安装,通过一个1"直径的钻孔(与垂直)炉壁中， 和通过绝缘材料。焊接1"NPT x 3"龙头至墙壁如图所示。线1"球形阀在3"球形阀之上，并且通过6"龙头进入球形阀。
Modifications to the original ASM arrangement have been made for convenience and safety in use. In operation, the ball valve is closed and the rod (with the cap in place) is prepared for insertion by applying the rolled shim stock around the rod between the fixed washers at the insertion end. The coupon end is then placed in the 6"nipple, and the cap is screwed into place.
对原始的ASM 排列为了方便和安全使用做了改变。运转中,
弹子阀是闭合的并且标尺(与盖帽位置)
为插入准备由应用被滚动的垫片试料块在标尺附近的固定清洗机之间插入末端。试料块末端被安置在6"nipple, 并且在把盖帽拧紧

THE PROCEDURE程序

1. Wait until the furnace is up to temperature and the atmosphere has lined out at the set point carbon potential. There should be work in the furnace in order to best test the stable carbon potential.

等待熔炉直到在标准温度之上并且气氛
标出在碳势设置点之内。那里应该配合熔炉便于测试稳定的碳势。Open the ball valve and insert the rod fully into the furnace. Start timing. The sample should remain in the furnace for the minimum time listed in the following table:
打开弹子阀并且完全把ROD 插入炉中，开始定时，样品需要保持在熔炉中一些时

间跟下表：

TEMPERATURE	SAT'N %C	MIN. TIME- MINUTES
1550	1.05	45-65
1600	1.11	30-50
1650	1.21	20-40
1700	1.31	15-30
1750	1.4	10-25

2. Pull the rod out until the center washer contacts the cap, then move back in 1/4". Wait for ten minutes, then close the valve.

拉杆在外直到清洗机中心接触接触顶点，然后移至1/4“，待10分钟后，关闭弹子阀

3. Unscrew the cap and remove the rod from the nipple. With gloves on, remove the shim and reweigh it. Report the results as:

旋开阀帽，移出ROD从NIPPLE.戴上手套，移出垫片并且称重，记录结果如：

% carbon ((Weight change x 100)/ original weight) + original % carbon

%碳（改变后的重量×100）/原始重量）＋原始%碳）

Note that a negative weight change corresponds to a lower % carbon in the atmosphere than the original shim material, and the calculation will provide the correct atmosphere composition.

记录一个负重量改变符合至%碳比原始垫片材料降低，然后计算提供实际气氛合成物

SHIM STOCK INSERTION ASSEMBLY

NOTE: SEE ASM HANDBOOK,VOL.4,NINTH EDITION,PAGES 434,435.

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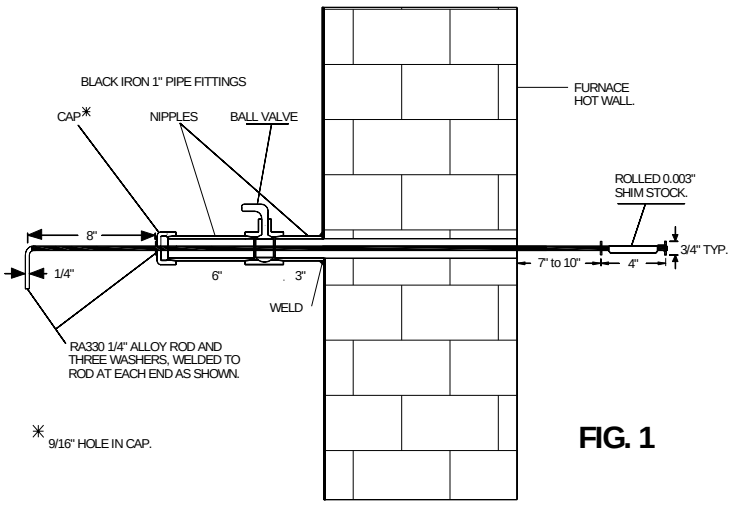

FIG. 1

SHIM STOCK ANALYSIS

Technical Data

CONSIDERATIONS

◆It is desirable to mount the shim apparatus close to the carbon sensor or sampling location. This is especially important in continuous furnace where the controls are for the zone in question.
需要增加垫片接近于碳传感器或采样点。这是特别重要连续的熔炉里便于控制在问题区域
◆When working in atmospheres above saturation levels, (as shown in the dwell timetable) the coupon will normally have a matte finish representing loose dry carbon. This material should be wiped off before weighing.
当在工作环境高于饱和状态上，（时间表有显示）试料片通常有镀锡板呈现松散的干碳。此种材料要擦净后再称其重
◆Note that the dwell timetable lists a range of dwell times. The appropriate actual value should be established by trial and error for each individual installation The dwell time is affected by many factors such as the degree of agitation, the normal carbon level, proximity to catalytic alloy. In any event, it is desirable to equilibrate for no longer than the recommended time due to the development of carbides at carbon levels above saturation.
记录在时间表中数据区域停压时间。合适实际值由反复实验得出在每次单独安装时得出。时间将受多种因素改变，如搅动温度，一般碳势水平，拼接接触反应合金。在任何变化中，使它平衡的时间不要比推荐时间长在碳化物增长高于碳势饱和。
◆No stock other than 0.003" thick should be used. This provides for a minimal time in the atmosphere and expedites the results.
其定碳片厚度不高于0.003“可用。其供应 一个最小值在气氛和讯速得出结果

EVALUATION赋值

Because the shim stock is so thin, it will achieve the true carbon potential throughout. The work will not normally achieve the same level at the surface because diffusion to the core keeps it at a lower level.

由于定碳片很细，它始终将达到标准的碳势。工作通常不会达到同样水平在表面因为扩散对核心保留它在底层。

SHIM STOCK ANALYSIS

Technical Data

CALCULATION OF CORRECT PROCESS FACTOR正确计算程序要素

Since the purpose of the test is to verify the validity of the controller calibration, the following equations provide you with the tools necessary to modify the calibration factor used in your atmosphere controller.

因为测试的目的将核实控制器校准的有效性,
以下等式提供您以工具必要修改校准因素被使用在您的大气控制器中

The following simple equation may provide you with a reasonably good COF value for precise control:

以下方程可提供您合理地COF 价值为精确控制:

$$COF_{new} = COF_{original} \times \%C_{shim\ stock} / \%C_{set\ point} \qquad (1)$$

If, using this value there is still some disparity between the set point value and the shim stock value, multiply the COF_{new} value as calculated above, by the correction factor F, shown in equation (2), using the same values from Equation (1):
如果, 使用这值仍然有某一差距在凝固点价值和定碳片试料块
依照被计算倍增COF新值上, 被更正因素F, 被显示在等式(2), 使用同样值从等式(1)::

$$COF_{new(corr)} = F \times COF_{new} \quad \text{where} \quad F = (3.79-\%C_{set\ point}) / (3.79-\%C_{shim\ stock}) \qquad (2)$$

N o t e s

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