

SC 法混凝控制系统测控信号的质量特性

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提要 测控信号是系统实现控制的依据,针对 SC 法混凝控制系统的测控信号进行了研究和讨论,给出了确保信号质量的实用方法。

关键词 流动电流 混凝控制 测控信号 质量特性

0 引言

对于一个自控系统来说,测控信号是系统赖以实现的控制依据,只有采集到及时准确的测控信号,系统才能进行后续的计算和控制。

在混凝控制领域内,SC 法混凝控制系统已成为当今的主流,其已被国内外越来越多的水厂所采用^[1]。SC 为流动电流(Streaming Current)英文字头的缩写。该系统的核心为流动电流(SC)测控器,测控信号为流动电流(SC)信号,本文就是针对该 SC 检测信号而进行的研究和讨论。

1 关于 SC 检测信号

SC 传感器产生的信号是很微弱的,据文献资料^[2],其数值 $10^{-10} \sim 10^{-12} \text{ A}$,如此小的数量级就必须对其进行放大处理。为测量如此微小信号,放大电路必须具有较高的灵敏度,且为适应不同水质和各种药剂,其灵敏度能够连续可调;放大电路输入阻抗必须很低,否则将经过液体传导构成回路,致使电流泄漏。为适应此需要,在设计中采用多级放大电路,单级设档和连续可调;应用同步整流和分体控制等技术来确保 SC 测控信号的质量。

2 SC 信号的接地效应

典型的 SC-3000 型测控系统流程见图 1。从图 1 中可以看出,系统的测控器有接收信号的输入端子,也有发出信号的输出端子。接收的是从远程传感器传来的检测信号,给出的是输出端子的控制信号。SC 测控信号是从远程传感器通过双芯屏蔽信号线送入测控器的。

2.1 接地效应

SC 法混凝控制系统的接地位置有 3 个:1 号远程传感器接地;2 号测控器接地;3 号变频控制柜接地。

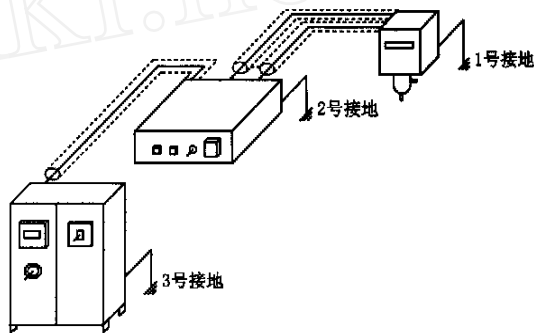


图 1 SC 控制系统接地

2.1.1 1 号远程传感器接地

该接地主要为传感器的外壳接地,是为安全起见而设的接地保护。该接地另一个作用是防止外部信号的干扰,确保检测系统是在一个没有外界信号干扰的情况下进行工作的。因此,对它的要求一般较高,需现场单独设置接地线,确保接地良好。

2.1.2 2 号测控器接地

测控器的电源接地十分重要,不仅仅是为了防止仪器漏电的保护接地。由于远程传感器和测控器之间有一定距离,而传感器产生的电信号又十分微弱,因而抗外界的干扰能力很差,甚至有时外界的干扰信号比要传送的信号强,所以信号的传送采用带有屏蔽的信号线。而信号线的屏蔽层接地端就应在测控器一侧,因为测控器这一方是信号的输入端,对这个接地我们要求现场做到单独接地。

2.1.3 3 号变频控制柜接地

变频器是强电(380V),它的安全性要求很高,而变频柜的接地在很大程度上是防止仪器外壳带电,保证安全。这个接地可以从电源控制总柜上引出的地线即可满足要求。

接地效应指的是电源接地对 SC 信号的影响。

具体分析如下。

2.2 接地效应对 SC 信号质量的影响

前已述及,接地共有 3 个。在这 3 个接地中,1 号和 2 号接地对 SC 信号的质量有很大的影响。图 2 和图 3 分别是北方某水厂 SC 系统安装后没有 1 号接地和有 1 号接地的 SC 检测值的变化情况,图 4 和图 5 分别是该水厂没有 2 号接地和有 2 号接地的 SC 值变化情况。从图中可以非常直观地看出接地前

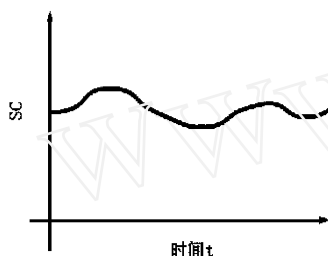


图 2 SC 随时间变化曲线

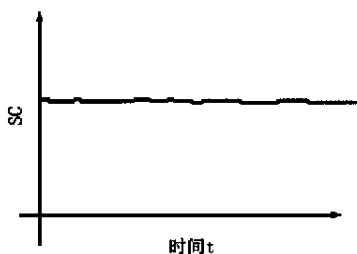


图 3 SC 随时间变化曲线

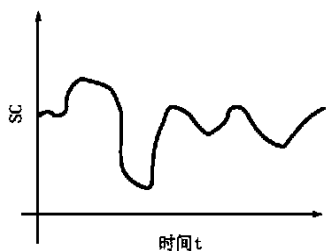


图 4 SC 随时间变化曲线

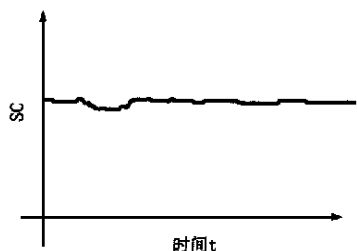


图 5 SC 随时间变化曲线

后的 SC 信号值变化的情况,接地后信号稳定,效果明显提高。

接地的独立性也很重要。在某些场合如南方某 B 水厂,其测控器和传感器共用一个地线时,SC 检测值变化大,改为单独接地后,信号值明显稳定。

由于现场条件的复杂性,干扰的介入可以说是无孔不入。在中原某水厂,经现场测定变频控制柜的干扰连续传入测控器。虽然测控器是输出端,但由于变频控制柜是强电,相对于干扰信号测控器亦是输入端,因此连接两个仪器信号线的屏蔽层接地就应接在测控器一端。经过这样处理后,干扰显著减弱了。

需要指出的是,由于接地效应十分复杂,不同现场条件可能影响的效果也不尽相同。所以在实际应用中如遇到 SC 信号质量问题时,应充分考虑现场的实际情况,具体问题具体分析,正确利用接地效应,以确保 SC 测控信号的质量。

3 结语

SC 信号为 SC 法混凝控制系统的测控信号,其质量的保证是系统能正常工作的前提。接地效应对 SC 信号质量影响较大,实际应用中应根据现场情况采用正确的接地方式以确保 SC 测控信号的质量。

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收稿日期:2000-3-6

更 正

《给水排水》2000 年第 9 期 67 页右栏倒数第 10 行“……二氧化碳气体浓度小于 1 000mg/L 后……”应改为“(3)当……二氧化碳气体体积分数小于 1/1 000 后,……”特此更正,并向作者致歉。

《给水排水》编辑部

On the Revision of Design Norm of Building Fire System From the Local Norm of Shanghai City Jiang Wenyuan (55)

Abstract : The Design Norm of Building Fire System is being revised in the round and the local fire system design norm of Shanghai city titled Fire System Design Regulations of Municipal Buildings is being established at the final moment. The establishing Regulations have advantages in high-pressure fire water system and approach to the international standards and are full of local colors. These will be references to the revision of the national norm.

Fire Water System Design of Big Underground Garage Wang Yaotang (57)

Abstract : The application of closed pre-action light water foam fire system for a large scale underground garage including the hydraulic calculation , systematic control and arrangement of nozzles are presented in this paper.

On Improved Bathroom Chen Guang (60)

Abstract : The consumers pay close attentions more and more to problems related to the quality of residential building construction , one of them is the leakage of bathroom. Some improved designs of bathroom are presented for reference.

Construction of Chemical Water Treatment System of Khartoum Refinery in Sudan Guan Yongtao et al (63)

Abstract : Experiences in construction of chemical water treatment system for the self-supply power station of Khartoum refinery in Sudan are described , which include the necessary design changes to solve problems caused by the local field situations like tropical climate , unfavorable support conditions and unconformities of equipment supplies. The project has been put into operation successfully.

Improvement of Imported Hydraulic Butterfly Check Valve Wang Hongwei et al (67)

Abstract : Problems of inharmonic action of imported hydraulic butterfly check valves in operating of the Shifo Waterworks in Zhengzhou city were presented. The electro-controller of the valve was reformed and the problem has been solved.

Improvement of Chlorination System of the 3rd phase of Guicheng Waterworks Zhang Minju et al (69)

Abstract : Some faults in the chlorination system of the 3rd phase construction of Guicheng waterworks are discussed , including the inexact readout between the Chlorine flow meter and the Chlorine transfer , the excess remain of displaced Chlorine container and the fluctuant free chlorine level in output water. Measures to improve the problems have been recommended.

On Application of Cathodic Protection of Steel Water Pipeline Ren Jicheng et al (71)

Abstract : The application of cathodic protection of steel water pipeline is summarized on the basis of the professional regulations in petroleum industry. Some criteria to be implemented have been put forwards in this paper.

Automation Design of Dengjiacun WTP in Xi 'an City Ma Weiwei et al (76)

Abstract : The composition and application of SCADA system for the Dengjiacun WTP in Xi 'an City are presented on the basis of the design of working drawing of this reformation project.

The Qualitative Characteristics of the Monitoring Signal for Streaming Current Coagulant Dosage System

..... Yang Wandong et al (79)

Abstract : The coagulant dosage system is to be controlled automatically by the monitoring signal. In this paper , the monitoring signal to control the automatic coagulant dosage system by Streaming Current pattern is discussed , and the effective method to ensure the quality of the signal is suggested.

Sponsored by Water & Sewage Society of CCES

China Building Technology Development Center

Edited by the Editorial Board of Water & Wastewater Engineering

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