

施工方案选择及技术经济分析

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摘要:用实例阐述了施工方案的选择及技术经济的分析在施工过程中的重要性,并对如何有效地降低工程投资进行了分析。

关键词:施工方案 选择 技术经济 分析

施工方案的选择是施工准备工作的关键环节,它贯穿于施工的全过程。一个合理的施工方案,不但能有效地保证工程进度、质量和安全,而且能最大限度地节约工程投资和降低工程成本。选择施工方案,必须从熟悉设计资料和施工条件着手,在掌握了这一系列技术资料的基础上,我们就可以本着从技术经济的角度,因地制宜和审时度势地选择施工方法和施工机械。

1 工程实例 1

某商住楼工程在进行施工方案设计时,为了选择和确定能保证钢结构质量的焊接方法,已初选出电渣焊、埋弧焊、CO₂焊、混合焊4个焊接方案。根据调查资料 and 实践经验,已定出各评价要素的权重及方案的评分值,见表1。

表1 评价要素及各方案评分值

序号	评价要素	权值(%)	方案满足程度(%)			
			电渣焊	埋弧焊	CO ₂ 焊	混合焊
1	焊接质量	40	80	70	40	60
2	焊接效率	10	80	70	80	70
3	焊接成本	30	80	100	100	100
4	操作难易	10	50	100	70	90
5	实现条件	10	40	100	100	100

此工程混凝土需求量为5 000 m³。混凝土工程施工有2种方案可供选择,A为现场制作,B为购买商品混凝土。已知商品混凝土平均单价为410元/m³,现场制作混凝土的单价计算公式为:

$$C = C_1/Q + C_2 \times T/Q + C_3 \quad (1)$$

式中: C ——现场制作混凝土的单价(元/m³);

C_1 ——现场搅拌站一次性投资(元),本案例 C_1 为20万元;

C_2 ——设置搅拌站设备装置的租金及维修费(与混凝土数量有关的费用),此案例 C_2 为1.5万元/月;

C_3 ——现场搅拌混凝土所需费用(与混凝土数量有关的费用),此案例 C_3 为220元/m³;

Q ——现场制作混凝土的总数量;

T ——工期(月)。

(1) 焊接方案的选择

由于任何一种焊接方法均涉及到焊接质量、焊接效率、焊接成本、操作难易和实现条件5个方面的评价要素,因而运用综合评价法进行评价比较方案的优劣,是最行之有效的方法。通过表1提供的数据,得出其方案评价价值如下:

$$E_i = \sum_{j=1}^5 (\text{方案满足程度} \times \text{权值}) \quad (2)$$

$$\text{电渣焊: } E_1 = 80 \times 0.4 + 80 \times 0.1 + 80 \times 0.3 + 50 \times 0.1 + 40 \times 0.1 = 73$$

$$\text{埋弧焊: } E_2 = 70 \times 0.4 + 70 \times 0.1 + 100 \times 0.3 + 100 \times 0.1 + 100 \times 0.1 = 85$$

$$\text{CO}_2 \text{ 焊: } E_3 = 40 \times 0.4 + 80 \times 0.1 + 100 \times 0.3 + 70 \times 0.1 + 100 \times 0.1 = 71$$

$$\text{混合焊: } E_4 = 60 \times 0.4 + 70 \times 0.1 + 100 \times 0.3 + 90 \times 0.1 + 100 \times 0.1 = 80$$

最大的方案评价价值为 $E_2 = 85$,故可选择埋弧焊

焊接方案。

当确定了钢结构的焊接方案之后,下面再运用背景给定的技术经济指标,进行混凝土施工方案分析与选择。

(2)方案与工期的关系

当A、B两个方案的成本相等时,工期T则满足以下关系:

$$200\,000/5\,000 + 15\,000 \times T/5\,000 + 320 = 410$$

$$T = 16.67(\text{月})$$

由此可得到以下结论:

①工期为16.67个月时,A、B两方案成本相同;

②工期 $T < 16.67$ 个月时,A方案(现场制作混凝土)比B方案(商品混凝土)经济;

③工期 $T > 16.67$ 个月时,B方案比A方案经济。

由于该工程工期要求较紧,要求混凝土浇筑工期为12个月,故采用现场制作混凝土较经济。

将 $T = 12$ 代入公式(1)得出现场制作混凝土的单价C;

$$C = 200\,000/5\,000 + 15\,000 \times 12/5\,000 + 320 = 396(\text{元}/\text{m}^3)$$

现场制作混凝土总费用用公式表示为:

$$X_1 = C \times Q = 396 \times 5\,000 = 1\,980\,000(\text{元})$$

若购买商品混凝土,则需费用用公式表示为:

$$X_2 = 410 \times 5\,000 = 2\,050\,000(\text{元})$$

$$X_1 - X_2 = 1\,980\,000 - 2\,050\,000 = -70\,000(\text{元})$$

从以上计算结果可以得出,采用现场制作混凝土比购买商品混凝土节约投资7万元。

2 工程实例2

某建筑公司承担了某基坑土方的施工,该工程基坑土方量为 $15\,000\text{ m}^3$,坑深为4m,平均运土距离为5km。公司现有WY50、WY75、WY100液压挖掘机及5t、8t、15t自卸汽车各若干台,其主要参数见表2~表3。

表2 挖掘机主要参数

型 号	WY50	WY75	WY100
斗容量(m^3)	0.5	0.75	1.0
台班产量(m^3)	480	558	690
台班价格(元/台班)	475	530	705

表3 自卸汽车主要参数

载重能力	5 t	8 t	15 t
运距5 km时台班产量(m^3)	40	62	103
台班价格(元/台班)	318	388	753

由于该公司还承担着其它工程项目,因而挖掘机与自卸汽车按表中型号只能各取一种。为了选择一种最经济合理的组合方案,我们按单位费用最低的原则来选取机械型号。

①先选挖掘机

$$\text{WY50: } 475/480 = 0.99 \text{ 元}/\text{m}^3$$

$$\text{WY75: } 530/558 = 0.95 \text{ 元}/\text{m}^3$$

$$\text{WY100: } 705/690 = 1.02 \text{ 元}/\text{m}^3$$

从以上计算结果得出:取单价为 $0.95 \text{ 元}/\text{m}^3$ 的WY75挖掘机最经济;

②后选择自卸汽车

$$5 \text{ t: } 318/40 = 7.95 \text{ 元}/\text{m}^3$$

$$8 \text{ t: } 388/62 = 6.26 \text{ 元}/\text{m}^3$$

$$15 \text{ t: } 753/103 = 7.31 \text{ 元}/\text{m}^3$$

从以上计算结果得出:取单价为 $6.26 \text{ 元}/\text{m}^3$ 的8t自卸汽车最经济。

通过以上技术经济分析,选择WY75挖掘机和8t自卸汽车的组合方案最经济合理。其中每立方米土方挖和运输的直接费用用公式表示为:

$$0.95 + 6.26 = 7.21 \text{ 元}/\text{m}^3$$

3 结论

通过以上2个实例可以看出,施工方法和施工机械的选择正确与否,将直接影响到工程的投资。可见,施工方案的选择及技术经济的分析在施工过程中占有举足轻重的地位。

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Spray turfing – the best option for "green corridor construction" of railways

The spray turfing technology serves as effective measures for the green protection of railway subgrade side slopes and is an important means to materialize the "green corridor construction" of railways.

Keywords: Spray turfing, green corridor, best option

Exploration of additional cost incurred from the raise of subgrade compactness test standard

Qinhuangdao – Shenyang passenger special line is a new type of fast speed railway, for which additional construction cost is incurred due to the raise of test standard of roadbed compactness. In view of this, the author makes, combined with his own experience in course of construction, a brief analysis and gives the solution.

Keywords: Subgrade, test standard, cost analysis

Strengthening construction organization design provides the foundation for control over construction cost and quality

This paper narrates the role played by the construction organization design in the control over construction investment and ensuring construction quality. It also gives a description on how to do a good job of making construction organization designs.

Keywords: Construction organization design, control, investment, quality

Exploration into introduction of management mode of construction work in the management of construction projects

This paper makes an analysis on the traditional management mode of engineering projects, introduces the management mode of CM manager and analyzes the viability of implementing the latter in our country.

Keywords: Construction project, management, mode, exploration

Construction scheme selection and technical & economic analysis

Examples are used to describe the importance of the selection of construction schemes and technical and economic analysis in course of construction. The paper also makes an analysis on how to effectively lessen construction cost.

Keywords: Construction scheme, selection, technical & economic analysis

Controlled blasting of stone work and unit price analysis for the construction of second track added to the existing one

Based on the conditions of station stone blasting of the additional second track project to a certain single railway line, norm analysis and probe are made of the stone explosions and protection works to accumulate basic data for supplementing the rating of controlled blasting of stone work.

Keywords: Controlled explosion of stone work, unit price analysis

A simplified pattern in cost calculation of railway building & structure works

The image progress of separate engineering items actually finished on the construction site is transformed, through experience factors, into parcel items before their being converted, again by way of experience factors, to square metres per unit item to simplify cost calculation.

Keywords: Railway, building & structure, cost calculation, pattern

Determination and main features of Budget Price of Railway Engineering Materials

This paper briefs on the determination and main features of the newly promulgated Budget Price of Railway Engineering Materials.

Keywords: New material, budget price, determination, features