Memo To: S. El-Alfy

CC: S. McAlpine, K.Blower

From: K. Morton

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Subject: **ARSENIC RECLAIM PLANT - CONVEYING SYSTEMS**

Introduction

The baghouse dust that we will be using as feed for the ARP is not only highly toxic, it will normally be extremely dusty and will have very poor flow characteristics. In each case, these factors must be considered when choosing conveying systems for various parts of the plant.

Given the toxic nature of the dust, environmental control and occupational health are of particular importance and equipment selection will be based, not only on the ability to convey the material but to do so at minimum risk to the workforce and to the environment.

Discussion

When evaluating equipment for a new plant, it can helpful to separate the essential features from those that are simply desireable, the candidates that do not have all of the essential features can then be eliminated and the final choice be made from among the remaining few. In this case, there are two essential features that the equipment must have, as follows:

Suitability of Application. Can the equipment convey the material from point A to point B at the rate required?

Environmental Control. Does the equipment have, or can it be equipped with the necessary level of dust control to achieve dust emission and ambient air quality standards?

Desireable features include such things as:

Good Availability. High maintenance requirements will contribute to increased employee exposure. Ease of maintenance is also important, eg. some rotary valves must be removed and dismantled in order to change bearings. Others have external bearings that can be changed quickly with the equipment left in place.

Low Capital Cost. Normally this will have to be balanced against other desireable features, budget constraints or personal preference.

Low Operating Cost. Often, a piece of equipment that performs the same job as another, does it in a completely different way that could significantly affect the operating cost, eg. a tubular drag conveyor capable of transferring 80 tpd of dust from a bin to the plant would require a drive of approximately 10 hp, a pneumatic system of the same capability needs about 40 hp to do the job.

Ease of Operation. A machine that needs a lot of operator attention is obviously less desireable than one that does not. Sometimes it is possible to make modifications or to add instrumentation and other remote or automatic controls to improve the situation. In other cases the only solution is to replace the equipment.

Our Plant

Materials handling will undoubtedly be the biggest part of the operators' jobs, whether they be underground, in the surface plant or at the transfer facility at Enterprise and for this reason, it is very important that equipment selection be done only after careful evaluation of the alternatives.

A list of conveying requirements followed by possible alternatives may be a good place to start the evaluation process. As plant design proceeds, we can consider the pros and cons of each and perhaps arrive at the most appropriate selection.

Underground, convey dust reclaimed from stopes to 200 ton surface storage silo. Transfer rate, up to 10 tph. Distance, up to 1000 ft horizontal and 160 ft vertical. Suitable equipment for this application could include dense phase pneumatic conveyor or dilute phase pneumatic conveyor. Due to the length of run, capital cost constraints and the need to relocate frequently, mechanical systems are not suitable.

Surface Storage Silo, convey dust from 200 ton silo to 50 to plant feed bin. Transfer rate, 4 tph. Distance, 60 ft horizontal, 25 ft vertical. Possible equipment for this application includes tubular drag conveyor, screw conveyor combined with bucket elevator or, pneumatic conveyor, either dense or dilute phase.

Plant Feed Bin, convey dust from bin to fluosolids reactor. Transfer rate, up to 2 tph. Distance, 15 ft. horizontal. Four requirements of this reactor feed system are: that there be no hangups or interruptions in feed to the reactor, that the feed rate be measurable, that the feed rate be controllable, and that no gasses be permitted to escape at the feed inlet due to positive pressure in the reactor. The first requirement can be met through installation of a bin activator or other device to ensure continuous discharge into the feeder. The second can be accomplished through use of a weigh feeder, a loss-in-weight feeder, a volumetric feeder, etc. The third requirement, that the feed rate be controllable, is usually done through variable speed drives, gate controllers, etc. The fourth can be achieved with a positive displacement feeder that can be sealed at the point that it discharges into the reactor. In each case, a variable-speed screw conveyor can be most easily adapted to the system. Pneumatic conveying devices are not

suitable due to the need to maintain air balances in the reactor and because of the difficulty in adapting feed rate measuring devices to this equipment.

Hot Baghouse, convey dust from baghouse to the gold residue pump. Transfer rate, up to 8 tpd. Distance, 10 ft. Screw conveyors are really the only suitable equipment for this application.

Cold Baghouse, convey dust from baghouse to compaction plant bucket elevator. Transfer rate, up to 40 tpd. Distance, 10 ft. Same comments as for hot baghouse.

Compaction Plant Feed, convey dust from cold baghouse screw conveyor to compactor. Transfer rate, up to 40 tpd. Distance, 15 ft vertical, 10 ft horizontal. Alternatives include tubular drag conveyor, bucket elevator combined with screw conveyor and, flexible screw conveyor. Pneumatic systems are not suitable because of the difficulty involved with handling large volumes of fluidizing and conveying air. Pneumatic systems find their best application in feeding into a closed bin from which exhaust air can be filtered prior to recycle or discharge to atmosphere.

Product Silo Feed, conveys crystalline product from the compaction plant to the 300 ton product silo. Transfer rate, up to 40 tpd. Distance, 10 ft horizontal, 40 ft vertical. Alternatives include screw conveyor combined with bucket elevator, dense or dilute phase pneumatic conveyor or, tubular drag conveyor.

Transfer Plant Truck Unloader, conveys crystalline product from truck discharge hoppers to railcar loading bin. Transfer rate, 10 tph. Distance, 30 ft horizontal, 35 ft vertical. The equipment must be installed for gravity feed from the truck. Alternatives include a Cambelt conveyor (a steep angle, enclosed belt conveyor specially built for railcar unloading), a dense or dilute phase pneumatic conveyor, a tubular drag conveyor, or a screw conveyor combined with bucket elevator.

Conclusions

In many materials handling applications there are several ways of getting the job done but it is unlikely that there is more than one 'best' way of doing it. In our case, getting the job done safely is the best way. All other considerations, important as they may be, must be secondary to this. Equipment evaluation then, must be viewed from this perspective and those responsible for plant design and equipment procurement should be aware of this priority.

K. Morton