28 PNEUMATIC CONVEYORS

W.94 Pneumatic Screw Pumps (FK Pumps)

1 Fineness

Dry pulverized materials can be conveyed by p.s.pumps Fineness should be at least

100%	Passing	300 microns
or 75%	Passing	150 microns
or 60%	Passing	74 microns
or 45%	Passing	44 microns
Preferably 80%	Passing	74 microns

2 Moisture

Should not exceed 1%. Material must flow freely without agglomeration

3 Temperature

Upto 200 ^{o}C	When pump has air-cooled seal ring and grease lubricated bearings
Upto 320 ^{o}C	When pump has water cooled seal rings and grease lubricated bearings

4 Size

Size indicates nominal diameter of screw. Screw has a varying pitch reducing towards discharge end. This compacts the material and deaerates it.

5 Capacities of screw are for 960 r.p.m. the normal running speed of an induction motor with a synchronus speed of 1000 r.p.m. at 50 cycles frequency. Max. Speed of screw is 1160 r.p.m.corresp. to frequency of 60 cycles

6 Capacities of screws are furnished in m^3/hr at 960 r.p.m. and for a given configuration of pitches. Thus a screw of same diameter will have diffrerent capacities for different pitches. Capacities in tons per hour (tph) are obtained by multiplying volumetric capacities by respective bulk densities commonly used bulk densities are

Raw meal	0.88, 0.96 and 1.04 t/m^3
Coal	0.56 t/m^3
cement	1.36 t/m^3

In case of cement, fineness of cement affects capacity in tph
Whether cement is produced in open or closedcircuit also affects the capacity

W.94 Pneumatic Screw Pumps (FK Pumps)

7 P.S. pumps should be run full; never less than 60 % of rated capacity in sizing a margin of 10 % is common over rated capacity.

Table of capacities

dia. of screw	m	0.265	0.25	0.2	0.15	0.1
of shaft	m	0.06	0.055	0.055	0.04	0.03
Effective area	m^2	0.052	0.047	0.029	0.016	0.007
Pitch average	m	0.18	0.138	0.138	0.138	0.093
Speed	r.p.m.	960	960	960	960	960
Filling factor		0.8	0.8	0.8	0.8	0.8
Performance factor		1	1	1	1	1
Capacity	m^3/hr	333	297	185	104	45
Capacity in Catalogue	m^3/hr	**134**	**86**	**50**	**16**	**4**
	%	40.3	29.0	27.1	15.3	8.8

Efficiency of a p.s.pump varies between say 10 % for 100 mm size to 30 % for a pump of 250 mm size. It is therefore difficult to arrive at the capacity from first principles and hence it is better to be guided by catalogues of manufacturers.

8 Requirement of compressed air for conveying
To work out compressed air requirement for pneumatic conveying of material discharged by the p.s.pump, the following data must be available.

1 material to be conveyed
2 its bulk density
3 rated capacity in t.p.h.
4 design capacity in t.p.h.
5 longest pumping distance over which material is to be conveyed
horizontal and vertical distances
no. of bends
no of diverting valves

each bend is to be taken as equivalent of 6 times dia. of pipe
each diverting valve is taken as equivalent of 6m length of pipe line

W.94 Pneumatic Screw Pumps (FK Pumps)

Example

Horizontal distance	m	100
Vertical distance	m	50
90 ^{o} bends		4
Pipe line size	mm	250
Diverting valve		1
Longest pumping		
Distance	m	162

Pipe line is sized to have design velocity at discharge end and to keep pressure drop line between 1.2 to 1.5 kg/cm^2 Velocities for raw meal are between 9-11 m/sec and for cement 10-12 m/sec.

Air to material ratios vary according to length of conveying and line size It is thus necessary to be guided by the manufacturer's advice in this respect. Compressor pressure Is selected by adding 0.35 to line pressure. Safety valve setting

Is 0.85 kg/cm^2 above the recommended compressor pressure. This helps in clearing temporary choking of pipe line. Like for sizing the PS Pumps, details of pipe line size, compressed air requirements should also be obtained from Designers of P.S.Pumps

Earlier pumps screws used to be overhung even for largest sizes (250-300 mm dia.) Now screw shaft is supported at both ends, eliminating vibrations.

Compiled from Fuller and CPAG Manuals