



**Johnson
Screens**

A brand of
Aqseptence Group

Muni-Pak screens — A better way to gravel pack

Johnson Screens' solution for improving gravel packing is the Muni-Pak™ screen. This pre-packed screen eliminates the need for a larger borehole, shortens the time required to drill a well and speeds development time.



For the well owner, the Muni-Pak screen offers long-term benefits. The latest Johnson Screens innovation uses glass beads as the filter media—a unique concept that reduces the likelihood of filter pack fouling from biofilm and encrustation, lowering overall well maintenance costs.

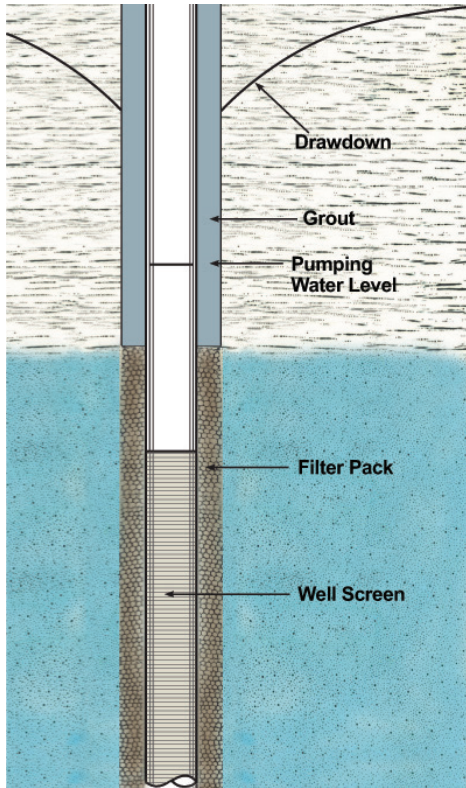
Artificial filter pack is one of the most common designs used today for high-capacity municipal, industrial and agricultural wells. Before the installation of a filter pack, the contractor and the well owner must take into account some significant issues:

- The borehole must be sufficiently oversized to allow for adequate placement of the filter pack. In practice, an annular thickness of 3 to 5 in. is considered minimum. The oversized borehole is costly to the contractor (and therefore to the well owner) and keeps the crew on site for additional time.
- The filter pack must be carefully selected, placed and developed to avoid bridging and sand pumping.
- The well owner is concerned with long-term performance. Biofouling and encrustation are issues that will eventually affect performance.

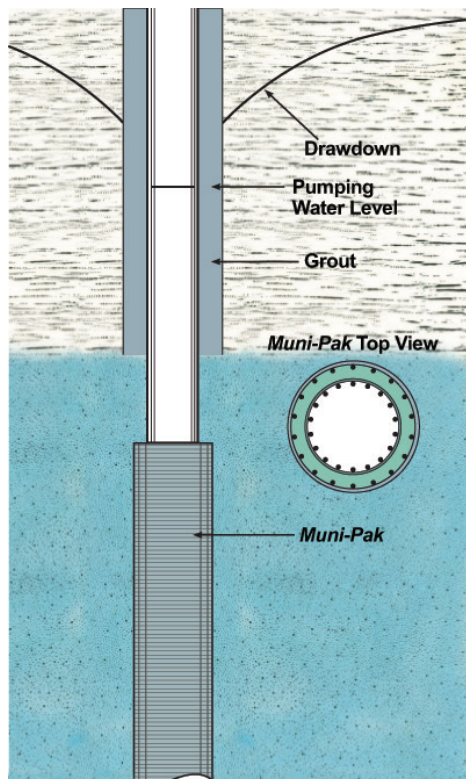
Applications

- Controls sand infiltration in new, high-capacity municipal, industrial and agricultural wells
- Can be used as a liner in existing wells to eliminate the need for constructing a new well
- Custom applications such as infiltration galleries
- Environmental remediations
- Horizontal applications.

Features, Advantages and Benefits



A Typical Gravel Pack Well



Muni-Pak Well

- The pre-packed construction of Muni-Pak screens allows the use of a smaller borehole versus gravel packed filtering, with fewer cuttings, reduced circulating volume and increased uphole velocity. This feature lowers bit and cement costs and reduces the drilling time.
- Since the media is included as part of the screen package, gravel placement is not required—eliminating bridging filter packs and time spent packing, as well as reduction of equipment requirements. The results are reduced installation time and lower costs.
- The Muni-Pak's dual-screen construction is four times stronger than standard rod-based screens, allowing more aggressive development and better immunity to unexpected hole problems—providing lower costs.
- A thinner filter pack results in a smaller annulus for easier development and rehabilitation of the near-well area over time, better formation penetration and more aggressive development. The benefits are a perfect media pack, reduced site time and lower risk.
- The wide range of diameters (1.25 to 20 in.) and connections (weld rings or threaded fittings) provides flexibility for meeting most application needs with a variety of standard or custom-end fittings—offering easier adaptation for a wide array of uses.
- The continuous-slot construction provides maximum open area, optimizing development and redevelopment. The result is thorough development.
- With custom lengths up to 20 ft., with no mid-weld, on-site welding requirements are reduced; thus, minimizing field assembly time and associated costs.
- Multiple wire-size and filter-media options enable custom applications and maximum depth capabilities, providing a wide range of uses.
- Glass beads improves efficiency by offering excellent roundness and sphericity, a lower uniformity coefficient for better hydraulic conductivity, better flow characteristics than silica sands, less buildup of biofilm and encrustation and easier media cleaning than with irregularly shaped silica sand grains.
- Muni-Pak works great as a liner in existing well construction, eliminating the need the construction and the cost of a new.

Installation costs: Muni-Pak Screen versus gravel pack filtering

Description	Single-String Completion	
	Gravel Pack	Muni-Pak
Mobilization	\$13,000	\$13,000
Demobilization	\$7,500	\$7,500
Drilling	\$94,509	\$74,184
Casing	\$35,827	\$35,827
Screen	\$27,633	\$76,700
Gravel Pack	\$14,959	\$0
Grout	\$40,881	\$28,350
Development	\$24,844	\$16,148
Testing	\$7,800	\$7,800
Disinfection	\$275	\$275
Video	\$700	\$700
Site Cleanup	\$12,000	\$12,000
Totals	\$279,928	\$272,484

Muni-Pak Screen Specifications

Size ¹ (in.)	Approx. Screen ID (in.)	Approx. Screen OD (in.)	Media Annular Thick- ness (in.)	Inner Screen Open Area - sq. in./ft. of Screen								Outer Screen Open Area - sq. in./ft. of Screen								Approx. Screen Weight (lbs/ft.)
				Screen Slot Size (thousandths of an in.)								Screen Slot Size (thousandths of an in.)								
				10	20	30	40	50	60	80	100	10	20	30	40	50	60	80	100	
2 x 4	1.5	4.5	0.85	13	22	30	35	40	44	51	55	24	42	56	68	77	85	97	106	17
3 x 5	2.8	5.7	0.97	20	35	46	55	63	69	79	86	30	53	70	84	96	105	120	132	23
4 x 6	3.8	6.7	0.94	25	44	59	70	80	87	100	110	36	62	83	100	114	125	143	156	25
5 x 7	4.7	7.7	0.87	30	53	70	84	96	105	120	132	40	70	94	113	128	141	161	176	27
6 x 8	5.8	8.7	0.84	36	62	83	100	114	125	143	156	46	81	108	129	147	162	185	202	35
8 x 10	7.7	10.8	0.84	33	60	82	101	117	131	155	172	41	74	102	125	145	162	191	213	55
10 x 12	9.8	12.8	0.84	41	74	102	125	145	162	191	213	48	88	121	148	172	193	226	253	70
12 x 15	11.8	15.0	0.84	59	106	143	173	199	220	255	281	69	122	165	200	230	255	295	325	85
14 x 16	13.0	16.0	0.64	42	78	108	135	159	180	215	244	48	89	125	155	183	207	247	281	100
16 x 18	15.0	18.0	0.64	48	89	125	155	183	207	247	281	54	99	139	173	204	230	276	313	115
18 x 20	16.9	20.0	0.78	54	99	139	173	204	230	276	313	59	110	154	192	226	256	306	347	128

Muni-Pak Screen vs. Standard Rod Based Screen

Nominal Size (in.) ²		Collapse Strength (PSI)		Tensile Strength (lbs.)	
Rod Based	Muni-Pak	Rod Based	Muni-Pak	Rod Based	Muni-Pak
2	2 x 4	1,940	16,500	4,300	12,500
3	3 x 5	540	5,650	5,200	15,000
4	4 x 6	730	2,830	6,100	18,800
5	5 x 7	440	1,550	7,000	20,700
6	6 x 8	260	990	17,600	41,600
8	8 x 10	250	1,160	24,200	50,000
10	10 x 12	360	630	30,800	81,400
12	12 x 15	220	880	35,200	87,000
14	14 x 16	170	1,110	35,200	95,400
16	16 x 18	170	760	72,200	135,900
18	18 x 20	130	540	74,200	147,200

Notes:

- Other sizes available upon request
 - Values compare 1,000 ft. construction Muni-Pak to 1,000 ft. construction rod base
1. Other sizes available upon request
 2. Table compares 1,000 ft. rod-based construction vs 1,000 ft. Muni-Pak construction

Standard Glass Filter Pack Sizes

Screen Slot Size (Thousandths of an in.)	Bead Diameter (in.)	Bulk Density (lb. ft. ³)
10	0.016 - 0.024	93.0
20	0.030-0.0390	93.0
30	0.039 - 0.051	94.3
40	0.049 - 0.065	94.3
50	0.061 - 0.073	94.9
60	0.079 - 0.094	95.5
80	0.094 - 0.114	95.5
100	0.112 - 0.136	95.5



Packing process allows for a thinner filter pack

Improving the life cycle of wells

Success showcases

New life for an old collector well

Collector wells are major investments and not easily replaced. The City of Nekoosa, Wisconsin, constructed two in the 1960s. One became so severely biofouled and encrusted that pumping just 200 GPM practically dewatered the laterals. The problem was that the design of the original laterals did not facilitate effective rehabilitation (The original laterals were slotted 8 in. PVC).

The advantages of Muni-Pak screens were introduced the contractor:

- The prepack design simplified installation
- The high open area with a compact, highly conductive ceramic or glass beads pack facilitated development (and future maintenance)
- The properties of the ceramic or glass beads deter biological growth

Three Muni-Pak laterals were successfully installed without removal of the existing PVC laterals. After development and testing, the refurbished collector well had more than a sevenfold increase in specific capacity and testing determined that 78 percent of the production came from the Muni-Pak laterals.

New pre-pack screen installed in Indiana well

The City of LaPorte, Indiana, was planning construction of a new well in its Warneke field. Existing wells in this field were underreamed, gravel packed completions drilled by reverse circulation and had been plagued with decreased specific capacity.

The city's contractor worked with the city engineers on presenting the Muni-Pak product.

Despite an initial concern about proper packing and adequate production from a pre-pack design, the city chose the Muni-Pak solution for several reasons:

- The pre-pack design negated concerns over proper pack placement
- The slim pack afforded greater development potential than an underreamed completion
- Ceramic or glass beads pack are considered superior to conventional silica sand

After successful placement of the Muni-Pak screen, the new well was developed without a problem, and a 24 hr. pumping test was conducted. The well produced 805 GPM with a specific capacity of a 24.6 gal./min./ft. drawdown. This production compared favorably to the existing wells in the Warneke field, which had much larger underreamed holes.