

Production Planning Case Study

Helmut Simonis

email: helmut.simonis@insight-centre.org
homepage: <http://insight-centre.org/>

ENTIRE EDIH
Insight SFI Centre for Data Analytics
School of Computer Science and Information Technology
University College Cork
Ireland

Constraint Based Production Scheduling

Acknowledgments

This publication was developed as part of the ENTIRE EDIH project, which received funding from Enterprise Ireland and the European Commission.

Part of this work is based on research conducted with the financial support of Science Foundation Ireland under Grant number 12/RC/2289-P2 at Insight the SFI Research Centre for Data Analytics at UCC, which is co-funded under the European Regional Development Fund.

Key Points

- Case study from industry
- Production planning and detailed scheduling
- Based on project with medical devices company in Cork
 - Real problem
 - Realistic data
- Solved in two stages
 - Production planning based on run-out days and safety stock levels
 - Scheduling using our generic scheduling tool

Product List

Name	ShortName	Nr	DailySales	InventoryAtStart	CalcDaysCover	LotSize	CycleTime	LotDuration	Machine	ProductType	SafetyStock	SafetyAlert
P1	P1	1	3.20	877	274.06	163	1.33	217	8	pt1	66	253.44
P2	P2	2	11.40	1,011	88.68	240	1.20	288	8	pt2	774	20.79
P3	P3	3	796.20	26,204	32.91	420	2.10	882	5,7,9,10,13,14,16	pt3	12,108	17.70
P4	P4	4	233.80	7,877	33.69	420	2.00	840	5,7,9,10,13,14,16	pt4	3,358	19.33
P5	P5	5	267.30	7,152	26.76	350	2.30	805	5,7,9,10,13,14,16	pt5	3,906	12.14
P6	P6	6	606.20	18,654	30.77	350	2.30	805	5,7,9,10,13,14,16	pt6	9,293	15.44
P7	P7	7	137.30	4,939	35.97	420	2.00	840	5,7,9,10,13,14,16	pt7	1,979	21.56
P8	P8	8	88.30	3,152	35.70	350	2.30	805	5,7,9,10,13,14,16	pt8	1,342	20.50
P9	P9	9	77.20	2,688	34.82	420	2.10	882	5,7,9,10,13,14,16	pt9	1,082	20.80
P10	P10	10	165.60	5,971	36.06	420	2.10	882	5,7,9,10,13,14,16	pt10	2,649	20.06
P11	P11	11	60.70	2,310	38.06	420	2.10	882	5,7,9,10,13,14,16	pt11	877	23.61
P12	P12	12	51.80	1,928	37.22	350	2.30	805	5,7,9,10,13,14,16	pt12	883	20.17
P13	P13	13	79.00	2,231	28.24	320	2.30	736	5,7,9,10,13,14,16	pt13	1,193	13.14
P14	P14	14	271.20	8,951	33.01	432	2.10	908	5,7,9,10,13,14,16	pt14	3,732	19.24
P15	P15	15	86.60	3,244	37.46	336	2.00	672	5,7,9,10,13,14,16	pt15	1,454	20.67
P16	P16	16	42.40	2,110	49.76	420	2.10	882	5,7,9,10,13,14,16	pt16	875	29.13
P17	P17	17	17.60	681	38.69	420	2.00	840	5,7,9,10,13,14,16	pt17	290	22.22
P18	P18	18	217.50	5,710	26.25	336	2.00	672	5,7,9,10,13,14,16	pt18	2,814	13.31
P19	P19	19	56.30	2,450	43.52	420	2.00	840	5,7,9,10,13,14,16	pt19	804	29.24
P20	P20	20	13.60	506	37.21	480	2.00	960	5,7,9,10,13,14,16	pt20	272	17.21
P21	P21	21	10.80	977	90.46	360	2.10	756	5,7,9,10,13,14,16	pt21	293	63.33
P22	P22	22	21.80	1,538	70.55	420	2.00	840	5,7,9,10,13,14,16	pt22	349	54.54
P23	P23	23	189.10	5,195	27.47	360	2.30	828	5,7,9,10,13,14,16	pt23	2,941	11.92
P24	P24	24	9.50	886	93.26	350	2.30	805	5,7,9,10,13,14,16	pt24	191	73.16
P25	P25	25	7.50	326	43.47	120	2.30	276	5,7,9,10,13,14,16	pt25	210	15.47
P26	P26	26	11.60	418	36.03	360	2.10	756	5,7,9,10,13,14,16	pt26	187	19.91
P27	P27	27	16.50	1,388	84.12	480	2.10	1,008	5,7,9,10,13,14,16	pt27	218	70.91

Product List (Sorted by Daily Sales)

Product X														
Name	ShortName	Nr	DailySales▼	InventoryAtStart	CalcDaysCover	LotSize	CycleTime	LotDuration	Machine	ProductType	SafetyStock	SafetyAlert		
P3	P3	3	796.20	26,204	32.91	420	2.10	882	5,7,9,10,13,14,16	pt3	12,108	17.70		
P6	P6	6	606.20	18,654	30.77	350	2.30	805	5,7,9,10,13,14,16	pt6	9,293	15.44		
P14	P14	14	271.20	8,951	33.01	432	2.10	908	5,7,9,10,13,14,16	pt14	3,732	19.24		
P53	P53	53	267.70	8,264	30.87	504	1.20	605	1,2,3,8	pt2	3,734	16.92		
P5	P5	5	267.30	7,152	26.76	350	2.30	805	5,7,9,10,13,14,16	pt5	3,906	12.14		
P124	P124	124	242.70	16,503	68.00	240	5.00	1,200	15,18,19	pt65	3,595	53.19		
P4	P4	4	233.80	7,877	33.69	420	2.00	840	5,7,9,10,13,14,16	pt4	3,358	19.33		
P123	P123	123	223.40	7,600	34.02	490	2.33	1,142	1,2,3,8	pt51	3,738	17.29		
P18	P18	18	217.50	5,710	26.25	336	2.00	672	5,7,9,10,13,14,16	pt18	2,814	13.31		
P23	P23	23	189.10	5,195	27.47	360	2.30	828	5,7,9,10,13,14,16	pt23	2,941	11.92		
P56	P56	56	168.20	4,824	28.68	504	1.20	605	1,2,3,8	pt2	2,660	12.87		
P10	P10	10	165.60	5,971	36.06	420	2.10	882	5,7,9,10,13,14,16	pt10	2,649	20.06		
P59	P59	59	152.80	5,666	37.08	420	1.33	559	1,2,3,8	pt51	3,095	16.83		
P7	P7	7	137.30	4,939	35.97	420	2.00	840	5,7,9,10,13,14,16	pt7	1,979	21.56		
P57	P57	57	134.80	5,358	39.75	588	1.10	647	1,2,3,8	pt53	2,294	22.73		
P36	P36	36	133.50	3,895	29.18	336	2.00	672	5,7,9,10,13,14,16	pt36	2,057	13.77		
P54	P54	54	122.40	5,059	41.33	480	1.33	639	1,2,3,8	pt51	1,965	25.28		
P121	P121	121	98.10	4,334	44.18	588	1.10	647	1,2,3,8	pt53	1,524	28.64		
P8	P8	8	88.30	3,152	35.70	350	2.30	805	5,7,9,10,13,14,16	pt8	1,342	20.50		
P125	P125	125	86.90	8,593	98.88	240	5.00	1,200	15,18,19	pt65	1,022	87.12		
P15	P15	15	86.60	3,244	37.46	336	2.00	672	5,7,9,10,13,14,16	pt15	1,454	20.67		
P100	P100	100	85.20	2,665	31.28	420	1.33	559	1,2,3,8	pt56	1,115	18.19		
P55	P55	55	79.50	2,876	36.18	441	2.33	1,028	1,2,3,8	pt52	1,367	18.98		
P13	P13	13	79.00	2,231	28.24	320	2.30	736	5,7,9,10,13,14,16	pt13	1,193	13.14		
P9	P9	9	77.20	2,688	34.82	420	2.10	882	5,7,9,10,13,14,16	pt9	1,082	20.80		
P47	P47	47	74.60	5,391	72.27	160	6.84	1,095	2,11	pt47	1,132	57.09		
P11	P11	11	60.70	2,310	38.06	420	2.10	882	5,7,9,10,13,14,16	pt11	877	23.61		
P61	P61	61	60.30	2,758	45.74	490	1.33	652	1,2,3,8	pt56	1,073	27.94		
P78	P78	78	57.60	2,234	38.78	588	1.10	647	1,2,3,8	pt59	824	24.48		
P19	P19	19	56.30	2,450	43.52	420	2.00	840	5,7,9,10,13,14,16	pt19	804	29.24		

Product List (Sorted by Days Cover)

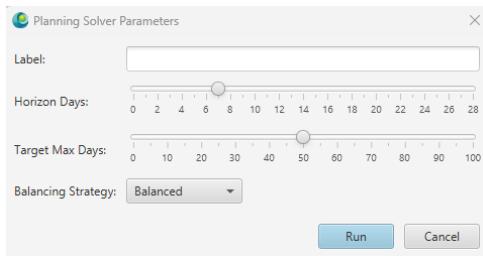
Product X														
Name	ShortName	Nr	DailySales	InventoryAtStart	CalcDaysCover	LotSize	CycleTime	LotDuration	Machine	ProductType	SafetyStock	SafetyAlert		
P35	P35	35	1.30	26	20.00	120	2.30	276	5,7,9,10,13,14,16	pt35	33	0.00		
P18	P18	18	217.50	5,710	26.25	336	2.00	672	5,7,9,10,13,14,16	pt18	2,814	13.31		
P5	P5	5	267.30	7,152	26.76	350	2.30	805	5,7,9,10,13,14,16	pt5	3,906	12.14		
P23	P23	23	189.10	5,195	27.47	360	2.30	828	5,7,9,10,13,14,16	pt23	2,941	11.92		
P13	P13	13	79.00	2,231	28.24	320	2.30	736	5,7,9,10,13,14,16	pt13	1,193	13.14		
P56	P56	56	168.20	4,824	28.68	504	1.20	605	1,2,3,8	pt2	2,660	12.87		
P58	P58	58	55.00	1,590	28.91	420	2.33	979	1,2,3,8	pt54	1,208	6.95		
P36	P36	36	133.50	3,895	29.18	336	2.00	672	5,7,9,10,13,14,16	pt36	2,057	13.77		
P6	P6	6	606.20	18,654	30.77	350	2.30	805	5,7,9,10,13,14,16	pt6	9,293	15.44		
P53	P53	53	267.70	8,264	30.87	504	1.20	605	1,2,3,8	pt2	3,734	16.92		
P100	P100	100	85.20	2,665	31.28	420	1.33	559	1,2,3,8	pt56	1,115	18.19		
P122	P122	122	45.40	1,421	31.30	490	1.33	652	1,2,3,8	pt56	725	15.33		
P3	P3	3	796.20	26,204	32.91	420	2.10	882	5,7,9,10,13,14,16	pt3	12,108	17.70		
P14	P14	14	271.20	8,951	33.01	432	2.10	908	5,7,9,10,13,14,16	pt14	3,732	19.24		
P4	P4	4	233.80	7,877	33.69	420	2.00	840	5,7,9,10,13,14,16	pt4	3,358	19.33		
P123	P123	123	223.40	7,600	34.02	490	2.33	1,142	1,2,3,8	pt51	3,738	17.29		
P77	P77	77	33.00	1,146	34.73	336	1.20	404	1,2,3,8	pt61	565	17.61		
P9	P9	9	77.20	2,688	34.82	420	2.10	882	5,7,9,10,13,14,16	pt9	1,082	20.80		
P8	P8	8	88.30	3,152	35.70	350	2.30	805	5,7,9,10,13,14,16	pt8	1,342	20.50		
P7	P7	7	137.30	4,939	35.97	420	2.00	840	5,7,9,10,13,14,16	pt7	1,979	21.56		
P26	P26	26	11.60	418	36.03	360	2.10	756	5,7,9,10,13,14,16	pt26	187	19.91		
P10	P10	10	165.60	5,971	36.06	420	2.10	882	5,7,9,10,13,14,16	pt10	2,649	20.06		
P55	P55	55	79.50	2,876	36.18	441	2.33	1,028	1,2,3,8	pt52	1,367	18.98		
P63	P63	63	42.40	1,565	36.91	490	1.33	652	1,2,3,8	pt51	689	20.66		
P59	P59	59	152.80	5,666	37.08	420	1.33	559	1,2,3,8	pt51	3,095	16.83		
P20	P20	20	13.60	506	37.21	480	2.00	960	5,7,9,10,13,14,16	pt20	272	17.21		
P12	P12	12	51.80	1,928	37.22	350	2.30	805	5,7,9,10,13,14,16	pt12	883	20.17		
P44	P44	44	5.50	205	37.27	360	2.10	756	5,7,9,10,13,14,16	pt44	126	14.36		
P15	P15	15	86.60	3,244	37.46	336	2.00	672	5,7,9,10,13,14,16	pt15	1,454	20.67		

Product List (Sorted by Safety Alert)

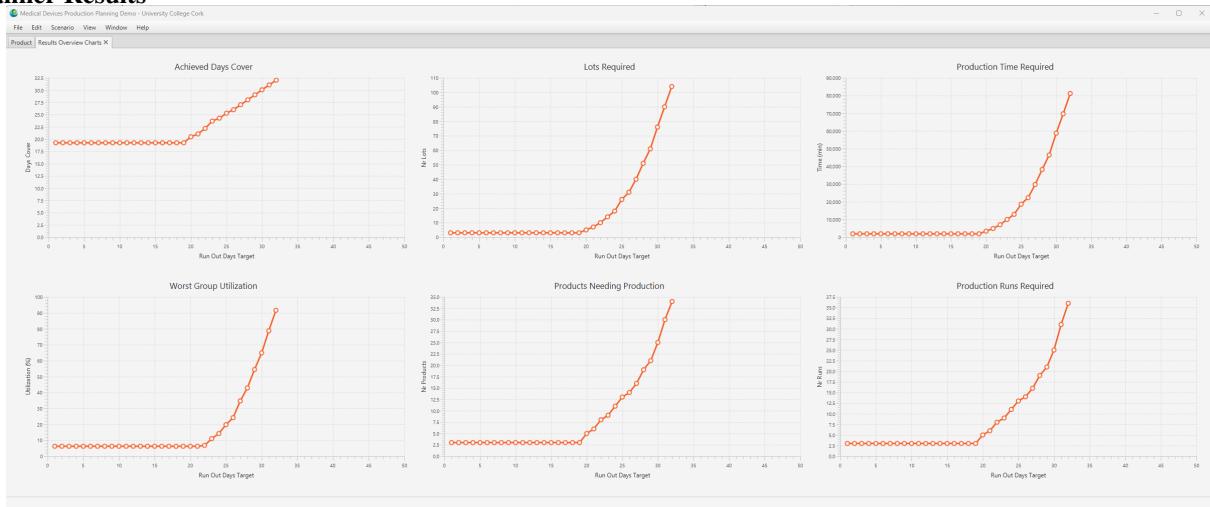
Product X																
Name	ShortName	Nr	DailySales	InventoryAtStart	CalcDaysCover	LotSize	CycleTime	LotDuration	Machine	ProductType	SafetyStock	SafetyAl...▲				
P35	P35	35	1.30	26	20.00	120	2.30	276	5,7,9,10,13,14,16	pt35	33	0.00				
P51	P51	51	5.70	405	71.05	140	4.50	630	2	pt50	381	4.21				
P58	P58	58	55.00	1,590	28.91	420	2.33	979	1,2,3,8	pt54	1,208	6.95				
P82	P82	82	6.10	259	42.46	441	1.33	587	1,2,3,8	pt51	189	11.48				
P23	P23	23	189.10	5,195	27.47	360	2.30	828	5,7,9,10,13,14,16	pt23	2,941	11.92				
P5	P5	5	267.30	7,152	26.76	350	2.30	805	5,7,9,10,13,14,16	pt5	3,906	12.14				
P56	P56	56	168.20	4,824	28.68	504	1.20	605	1,2,3,8	pt2	2,660	12.87				
P13	P13	13	79.00	2,231	28.24	320	2.30	736	5,7,9,10,13,14,16	pt13	1,193	13.14				
P18	P18	18	217.50	5,710	26.25	336	2.00	672	5,7,9,10,13,14,16	pt18	2,814	13.31				
P36	P36	36	133.50	3,895	29.18	336	2.00	672	5,7,9,10,13,14,16	pt36	2,057	13.77				
P44	P44	44	5.50	205	37.27	360	2.10	756	5,7,9,10,13,14,16	pt44	126	14.36				
P122	P122	122	45.40	1,421	31.30	490	1.33	652	1,2,3,8	pt56	725	15.33				
P6	P6	6	606.20	18,654	30.77	350	2.30	805	5,7,9,10,13,14,16	pt6	9,293	15.44				
P25	P25	25	7.50	326	43.47	120	2.30	276	5,7,9,10,13,14,16	pt25	210	15.47				
P59	P59	59	152.80	5,666	37.08	420	1.33	559	1,2,3,8	pt51	3,095	16.83				
P53	P53	53	267.70	8,264	30.87	504	1.20	605	1,2,3,8	pt2	3,734	16.92				
P112	P112	112	3.40	134	39.41	588	1.20	706	1,2,3,8	pt2	76	17.06				
P20	P20	20	13.60	506	37.21	480	2.00	960	5,7,9,10,13,14,16	pt20	272	17.21				
P32	P32	32	5.40	222	41.11	480	2.00	960	5,7,9,10,13,14,16	pt32	129	17.22				
P123	P123	123	223.40	7,600	34.02	490	2.33	1,142	1,2,3,8	pt51	3,738	17.29				
P99	P99	99	5.70	247	43.33	96	2.00	192	1,2,3,8	pt60	148	17.37				
P77	P77	77	33.00	1,146	34.73	336	1.20	404	1,2,3,8	pt61	565	17.61				
P3	P3	3	796.20	26,204	32.91	420	2.10	882	5,7,9,10,13,14,16	pt3	12,108	17.70				
P100	P100	100	85.20	2,665	31.28	420	1.33	559	1,2,3,8	pt56	1,115	18.19				
P55	P55	55	79.50	2,876	36.18	441	2.33	1,028	1,2,3,8	pt52	1,367	18.98				
P14	P14	14	271.20	8,951	33.01	432	2.10	908	5,7,9,10,13,14,16	pt14	3,732	19.24				
P80	P80	80	7.20	293	40.69	420	1.33	559	1,2,3,8	pt51	154	19.31				
P4	P4	4	233.80	7,877	33.69	420	2.00	840	5,7,9,10,13,14,16	pt4	3,358	19.33				
P49	P49	49	50.90	2,273	44.66	378	1.00	378	2	pt48	1,260	19.90				

Setup Matrix

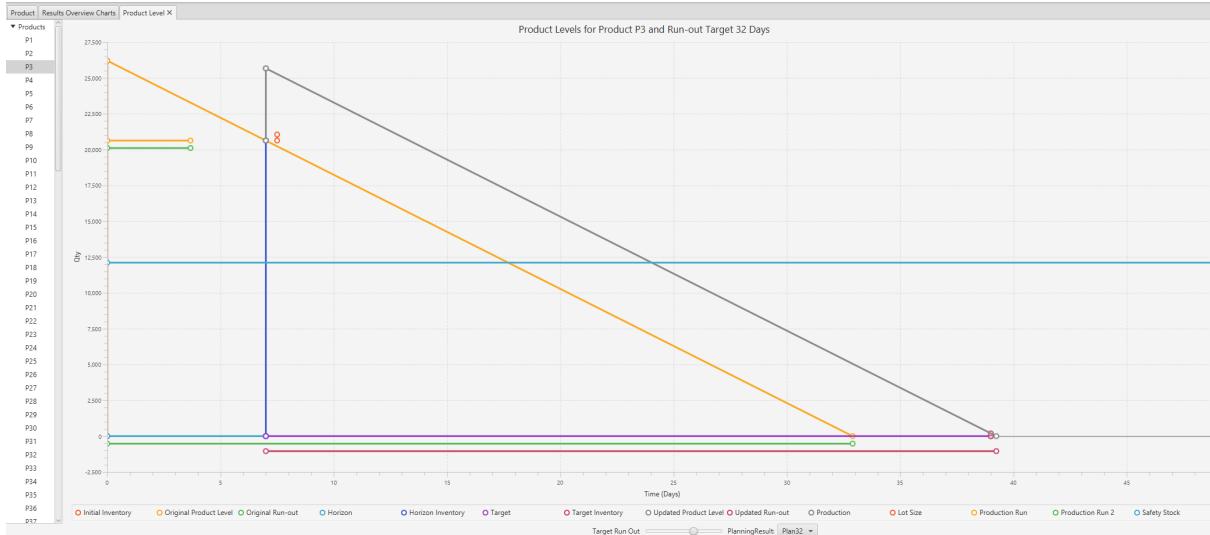
Row		Setup Matrix X	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10	p11	p12	p13	p14	p15	p16	p17	p18	p19	p20	p21	p22	p23	p24	p25	p26	p27	p28	p29	p30	p31	p32	p33	p34	p35	p36	p37	p38	p39	p40	p41	p42	p43	p44	p45	p46	p47	p48	p49	p50	p51	p52	p53	p54	p55	p56	p57	p58	p59	p60	p61	p62	p63	p64	p65	p66	p67	p68	p69	p70	p71	p72	p73	p74	p75	p76	p77	p78	p79	p80	p81	p82	p83	p84	p85	p86	p87	p88	p89	p90	p91	p92	p93	p94	p95	p96	p97	p98	p99	p100	p101	p102	p103	p104	p105	p106	p107	p108	p109	p110	p111	p112	p113	p114	p115	p116	p117	p118	p119	p120	p121	p122	p123	p124	p125	p126	p127	p128	p129	p130	p131	p132	p133	p134	p135	p136	p137	p138	p139	p140	p141	p142	p143	p144	p145	p146	p147	p148	p149	p150	p151	p152	p153	p154	p155	p156	p157	p158	p159	p160	p161	p162	p163	p164	p165	p166	p167	p168	p169	p170	p171	p172	p173	p174	p175	p176	p177	p178	p179	p180	p181	p182	p183	p184	p185	p186	p187	p188	p189	p190	p191	p192	p193	p194	p195	p196	p197	p198	p199	p200	p201	p202	p203	p204	p205	p206	p207	p208	p209	p210	p211	p212	p213	p214	p215	p216	p217	p218	p219	p220	p221	p222	p223	p224	p225	p226	p227	p228	p229	p230	p231	p232	p233	p234	p235	p236	p237	p238	p239	p240	p241	p242	p243	p244	p245	p246	p247	p248	p249	p250	p251	p252	p253	p254	p255	p256	p257	p258	p259	p260	p261	p262	p263	p264	p265	p266	p267	p268	p269	p270	p271	p272	p273	p274	p275	p276	p277	p278	p279	p280	p281	p282	p283	p284	p285	p286	p287	p288	p289	p290	p291	p292	p293	p294	p295	p296	p297	p298	p299	p300	p301	p302	p303	p304	p305	p306	p307	p308	p309	p310	p311	p312	p313	p314	p315	p316	p317	p318	p319	p320	p321	p322	p323	p324	p325	p326	p327	p328	p329	p330	p331	p332	p333	p334	p335	p336	p337	p338	p339	p340	p341	p342	p343	p344	p345	p346	p347	p348	p349	p350	p351	p352	p353	p354	p355	p356	p357	p358	p359	p360	p361	p362	p363	p364	p365	p366	p367	p368	p369	p370	p371	p372	p373	p374	p375	p376	p377	p378	p379	p380	p381	p382	p383	p384	p385	p386	p387	p388	p389	p390	p391	p392	p393	p394	p395	p396	p397	p398	p399	p400	p401	p402	p403	p404	p405	p406	p407	p408	p409	p410	p411	p412	p413	p414	p415	p416	p417	p418	p419	p420	p421	p422	p423	p424	p425	p426	p427	p428	p429	p430	p431	p432	p433	p434	p435	p436	p437	p438	p439	p440	p441	p442	p443	p444	p445	p446	p447	p448	p449	p450	p451	p452	p453	p454	p455	p456	p457	p458	p459	p460	p461	p462	p463	p464	p465	p466	p467	p468	p469	p470	p471	p472	p473	p474	p475	p476	p477	p478	p479	p480	p481	p482	p483	p484	p485	p486	p487	p488	p489	p490	p491	p492	p493	p494	p495	p496	p497	p498	p499	p500	p501	p502	p503	p504	p505	p506	p507	p508	p509	p510	p511	p512	p513	p514	p515	p516	p517	p518	p519	p520	p521	p522	p523	p524	p525	p526	p527	p528	p529	p530	p531	p532	p533	p534	p535	p536	p537	p538	p539	p540	p541	p542	p543	p544	p545	p546	p547	p548	p549	p550	p551	p552	p553	p554	p555	p556	p557	p558	p559	p560	p561	p562	p563	p564	p565	p566	p567	p568	p569	p570	p571	p572	p573	p574	p575	p576	p577	p578	p579	p580	p581	p582	p583	p584	p585	p586	p587	p588	p589	p590	p591	p592	p593	p594	p595	p596	p597	p598	p599	p600	p601	p602	p603	p604	p605	p606	p607	p608	p609	p610	p611	p612	p613	p614	p615	p616	p617	p618	p619	p620	p621	p622	p623	p624	p625	p626	p627	p628	p629	p630	p631	p632	p633	p634	p635	p636	p637	p638	p639	p640	p641	p642	p643	p644	p645	p646	p647	p648	p649	p650	p651	p652	p653	p654	p655	p656	p657	p658	p659	p660	p661	p662	p663	p664	p665	p666	p667	p668	p669	p670	p671	p672	p673	p674	p675	p676	p677	p678	p679	p680	p681	p682	p683	p684	p685	p686	p687	p688	p689	p690	p691	p692	p693	p694	p695	p696	p697	p698	p699	p700	p701	p702	p703	p704	p705	p706	p707	p708	p709	p710	p711	p712	p713	p714	p715	p716	p717	p718	p719	p720	p721	p722	p723	p724	p725	p726	p727	p728	p729	p730	p731	p732	p733	p734	p735	p736	p737	p738	p739	p740	p741	p742	p743	p744	p745	p746	p747	p748	p749	p750	p751	p752	p753	p754	p755	p756	p757	p758	p759	p760	p761	p762	p763	p764	p765	p766	p767	p768	p769	p770	p771	p772	p773	p774	p775	p776	p777	p778	p779	p780	p781	p782	p783	p784	p785	p786	p787	p788	p789	p790	p791	p792	p793	p794	p795	p796	p797	p798	p799	p800	p801	p802	p803	p804	p805	p806	p807	p808	p809	p810	p811	p812	p813	p814	p815	p816	p817	p818	p



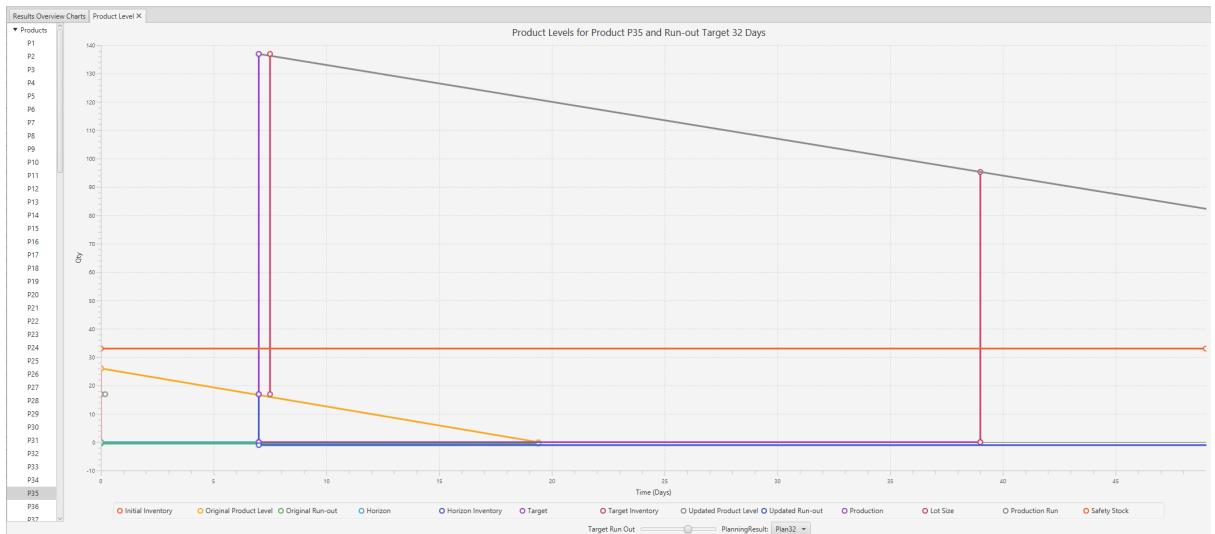
Planner Results



Product Level Chart for Product P3



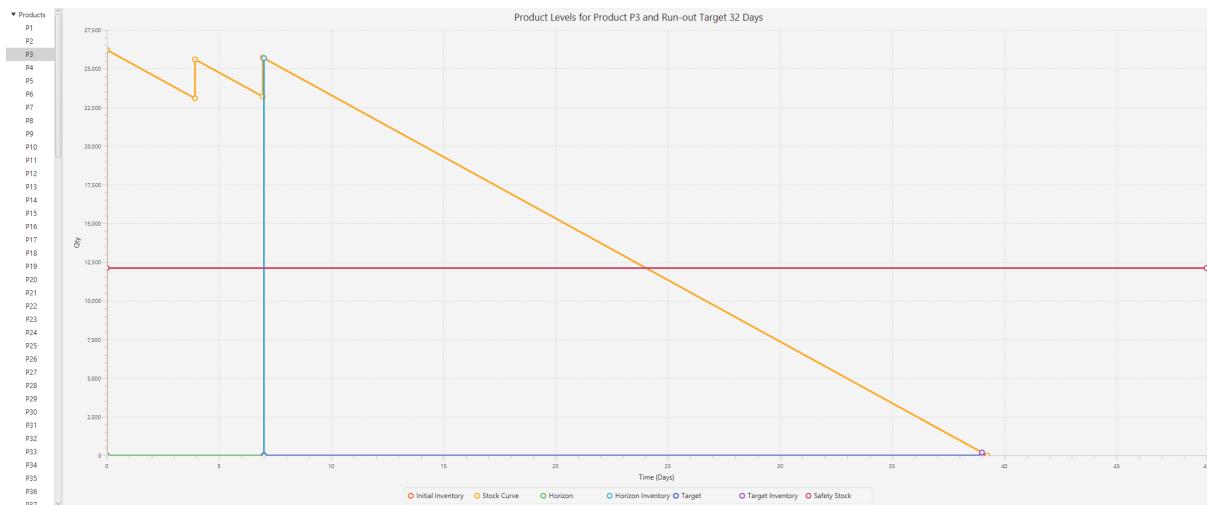
Product Level Chart for Product P35



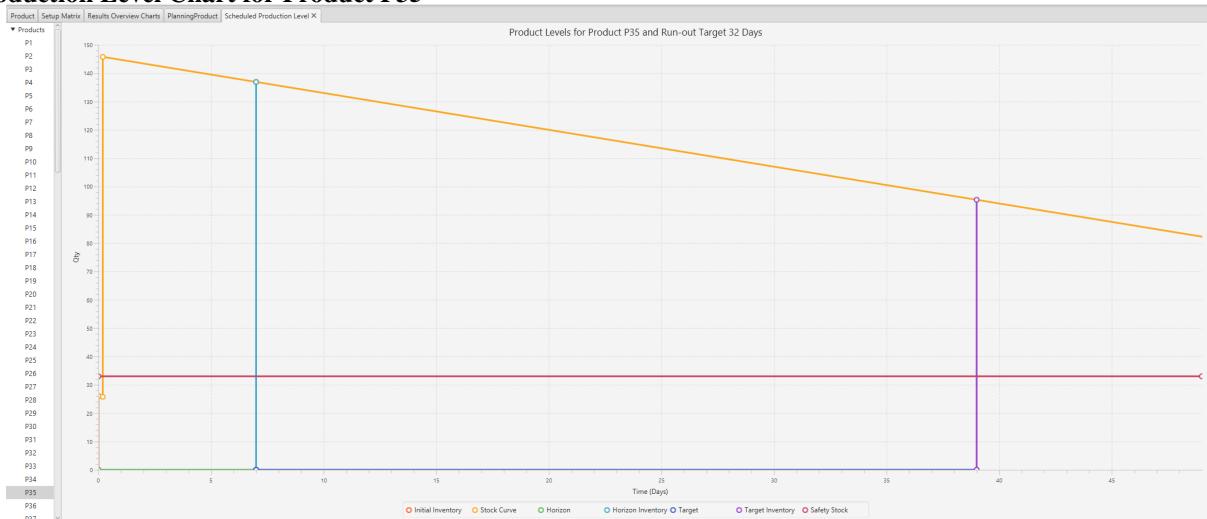
Scheduled Production Runs

Product	Results Overview Charts		Product Level		Scheduled Production Level		ProductionRun X		
Name	Product	NrLots	Qty	Due	Start	End	Duration	StartDay	EndDay
job3_0	P3	6	2,520	10,080	366	5,658	5,292	0.25	3.93
job3_1	P3	6	2,520	10,080	4,712	10,004	5,292	3.27	6.95
job4_0	P4	3	1,260	10,080	0	2,520	2,520	0.00	1.75
job5_0	P5	10	3,500	10,080	1,794	9,844	8,050	1.25	6.84
job6_0	P6	7	2,450	10,080	4,224	9,859	5,635	2.93	6.85
job6_1	P6	8	2,800	10,080	0	6,440	6,440	0.00	4.47
job7_0	P7	1	420	10,080	7,442	8,282	840	5.17	5.75
job8_0	P8	1	350	10,080	816	1,621	805	0.57	1.13
job9_0	P9	1	420	10,080	3,282	4,164	882	2.28	2.89
job10_0	P10	2	840	10,080	0	1,764	1,764	0.00	1.23
job11_0	P11	1	420	10,080	6,500	7,382	882	4.51	5.13
job12_0	P12	1	350	10,080	1,651	2,456	805	1.15	1.71
job13_0	P13	3	960	10,080	0	2,208	2,208	0.00	1.53
job14_0	P14	4	1,728	10,080	0	3,632	3,632	0.00	2.52
job15_0	P15	1	336	10,080	2,580	3,252	672	1.79	2.26
job17_0	P17	1	420	10,080	5,718	6,558	840	3.97	4.55
job18_0	P18	9	3,024	10,080	3,144	9,192	6,048	2.18	6.38
job20_0	P20	1	480	10,080	3,692	4,652	960	2.56	3.23
job23_0	P23	7	2,520	10,080	2,516	8,312	5,796	1.75	5.77
job26_0	P26	1	360	10,080	0	756	756	0.00	0.53
job35_0	P35	1	120	0	0	276	276	0.00	0.19
job36_0	P36	4	1,344	10,080	6,618	9,306	2,688	4.60	6.46
job44_0	P44	1	360	10,080	2,298	3,054	756	1.60	2.12
job46_0	P46	1	350	10,080	8,372	9,177	805	5.81	6.37
job51_0	P51	1	140	6,064	0	630	630	0.00	0.44
job53_0	P53	5	2,520	10,080	707	3,732	3,025	0.49	2.59
job55_0	P55	1	441	10,080	2,580	3,608	1,028	1.79	2.51
job56_0	P56	4	2,016	10,080	7,218	9,638	2,420	5.01	6.69
job58_0	P58	2	840	10,002	3,668	5,626	1,958	2.55	3.91
job59_0	P59	1	420	10,080	464	1,023	559	0.32	0.71
job63_0	P63	1	490	10,080	0	652	652	0.00	0.45
job77_0	P77	1	336	10,080	0	404	404	0.00	0.28
job78_0	P78	1	588	10,080	0	647	647	0.00	0.45

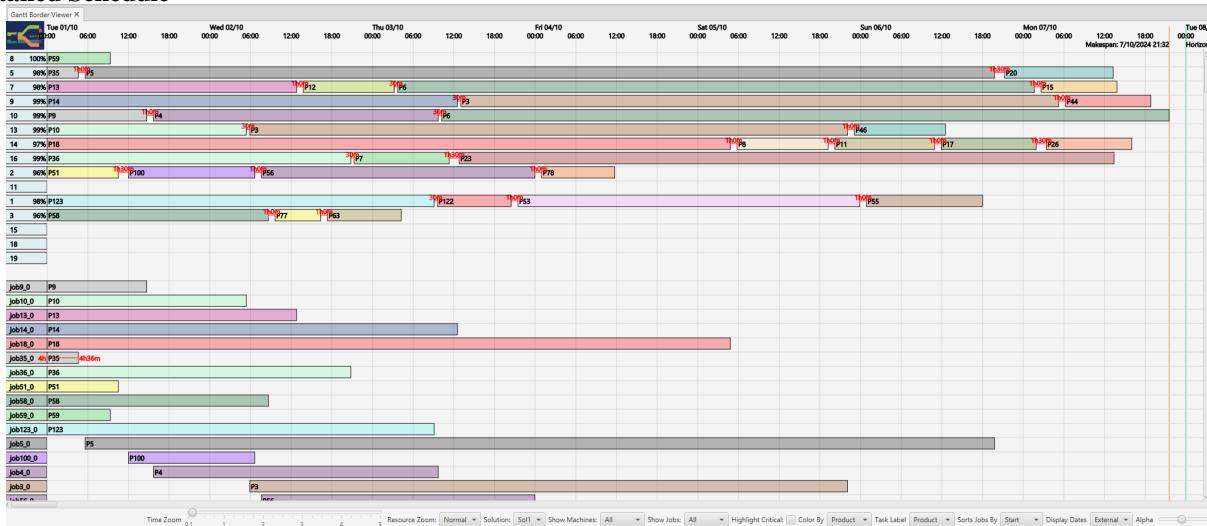
Production Level Chart for Product P3



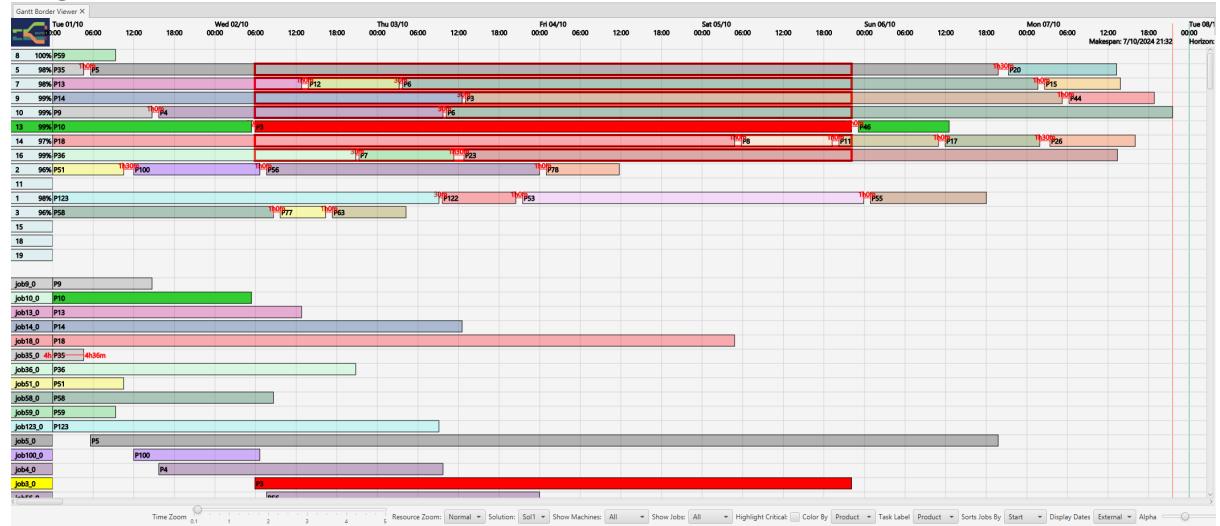
Production Level Chart for Product P35



Detailed Schedule



Showing Alternative Machines in Gantt Chart



Summary

- We demonstrated the use of our scheduling tool inside a production planning problem from industry
- Production planning decides which products to make in which quantity
 - Balance stock levels against projected demand
 - Allow for product specific safety stock levels
- Uses estimate of production capacity over planning horizon
- Use detailed scheduling to validate plan